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A DESCRIPTIVE CATALOG OF THE SHORE FISHES OF PERU

BY

SAMUEL F. HILDEBRAND

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Alexander Wetmore,
Secretary, Smithsonian Institution.

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A DESCRIPTIVE CATALOG OF THE SHORE FISHES OF PERU

By Samuel F. Hildebrand

INTRODUCTION

In 1941, upon the request of the Government of Peru, the United States Fish and Wildlife Service sent a delegation of three men—R. H. Fiedler, N. D. Jarvis, and M. J. Lobell—equipped with a fishing vessel and other essential apparatus, to Peru to explore the fisheries of that country. This survey was a part of the United States Government's program for cooperation with the other American republics authorized by an act of Congress. The expenses were defrayed by the Peruvian Government. The "Mission," as the delegation hereafter will be called, had as its chief assignments an investigation of the abundance of the fishery resources, the appropriate development of the fisheries, and the proper handling and utilization of the catch. The Government of Peru was interested chiefly because it seemed highly desirable to provide nourishing food for the population at a low cost if possible. This seemed especially desirable at the time because economic conditions were greatly disturbed by the wars raging elsewhere in the world. The Peruvian Navy was interested in the development of the fisheries, because a fishing fleet would provide additional coastal defense (see Fiedler, Jarvis, and Lobell, 1943, p. 1).

During the course of the explorations a collection of fishes, consisting of about 2,148 specimens, now deposited in the United States National Museum, was obtained. The work that resulted in the preparation of this descriptive catalog of the shore fishes of Peru had its inception when the study of that collection was undertaken. The desirability of examining other specimens from Peru and making the catalog as comprehensive as possible became apparent immediately. The study of all the specimens from Peru in the United States National Museum and a few borrowed from other museums (often involving a comparison of them with examples from other countries) and an examination of the literature have resulted in the recognition of 264 species of shore fishes from Peru, 51 of which appear to be new (see p. 503). This total number represents an increase of 106 species over the last, then complete, list published by Evermann and Radcliffe in 1917.

An effort was made to make the catalog so complete that no other books will be required for the identification of the shore fishes of Peru. The general biologist, who will want to identify fishes occasionally, the beginner, and the especially interested layman have always been kept in mind, and for them the work was made as simple as possible. Technical terms were avoided, if practicable. Definitions of the ones used are supplied (see p. 10), and most of the external characters commonly mentioned in descriptions are illustrated and named in figure 3. The use of internal characters, especially in the keys, was avoided as far as practical to eliminate the necessity of dissections. In brief, the catalog is intended to provide practical yet scientifically accurate means for the identification of the fishes in the area included.

LITERATURE ON THE FISHES OF PERU

The most important and comprehensive work on the classification of the fishes of Peru is the bulletin entitled "The Fishes of the West Coast of Peru and the Titicaca Basin," by Evermann and Radcliffe (1917), in which 158 species of marine fishes are listed and 38 are illustrated. This work was based chiefly on a collection made by Dr. R. E. Coker, who, as an employe of the U. S. Bureau of Fisheries, made an investigation of the fishery resources of Peru for the Peruvian Government in 1907 and 1908. That collection contained somewhat over 500 specimens, among which Evermann and Radcliffe recognized 120 species, 29 of which were from fresh water, and 12 (all marine forms) of the 120 were described as new. The authors gave descriptions of species of which specimens were included in Dr. Coker's collection, but not of other species recorded from Peru.

Other papers, based wholly or in part on the marine fishes of Peru, which were used freely in the preparation of this catalog, are the following:

"The Marine Fishes of Peru," by Abbott (1899), based chiefly on a small collection made at Callao in 1896 by Rear Admiral L. A. Beardsley, U. S. N., though all the marine fishes recorded from Peru, so far as known to the author, were listed. Also one new genus and five new species were described.

"On a Collection of Marine Fishes from Peru," by Nichols and Murphy (1922), based on a collection made in 1919 and 1920 by Dr. R. C. Murphy, the junior author, at various points between Lobos de Tierra Island (6°23′ S.) and Independencia Bay (14°18′ S.). In this collection 64 species were recognized, of which 2 were described as new. This paper also contains a discussion of the distribution and characteristics of the marine fishes of Peru, as well as fishes in general.

"The Fishes Obtained by the Wilkes Expedition, 1838–1842," by Fowler (1940), who listed 32 species, either definitely or questionably from Peru. The specimens upon which the records are based are in the U. S. National Museum, and those having rather definite locality labels with them have been reexamined and are mentioned in the accounts of the species with which they were identified.

Several other publications contain references and some descriptions of Peruvian fishes. These are listed in the bibliography, and references to them will be found in appropriate places in the text.

Among the publications not of a taxonomic nature on the fishes of Peru is the one by the Mission from the Fish and Wildlife Service to Peru in 1941, mentioned many times in the text as the "report of the Mission." This report is entitled "La Pesca y las Industrias Pesqueras en el Perú con Recomendaciones para su Futuro Desarrollo." Its authors are R. H. Fiedler, N. D. Jarvis, and M. J. Lobell, the members of the Mission, and it was published in 1943 (see bibliography). This report contains a discussion of the fisheries and their operation; statistics for the local fisheries; an account of the investigation conducted in 1941; recommendations for the development of the industry and for Government control of the fisheries; and a bibliography including especially publications of an economic nature. Although this report is mentioned again and again, and sometimes quoted, the reader is referred to it for further information as to the commercial importance of the food fishes of Peru.

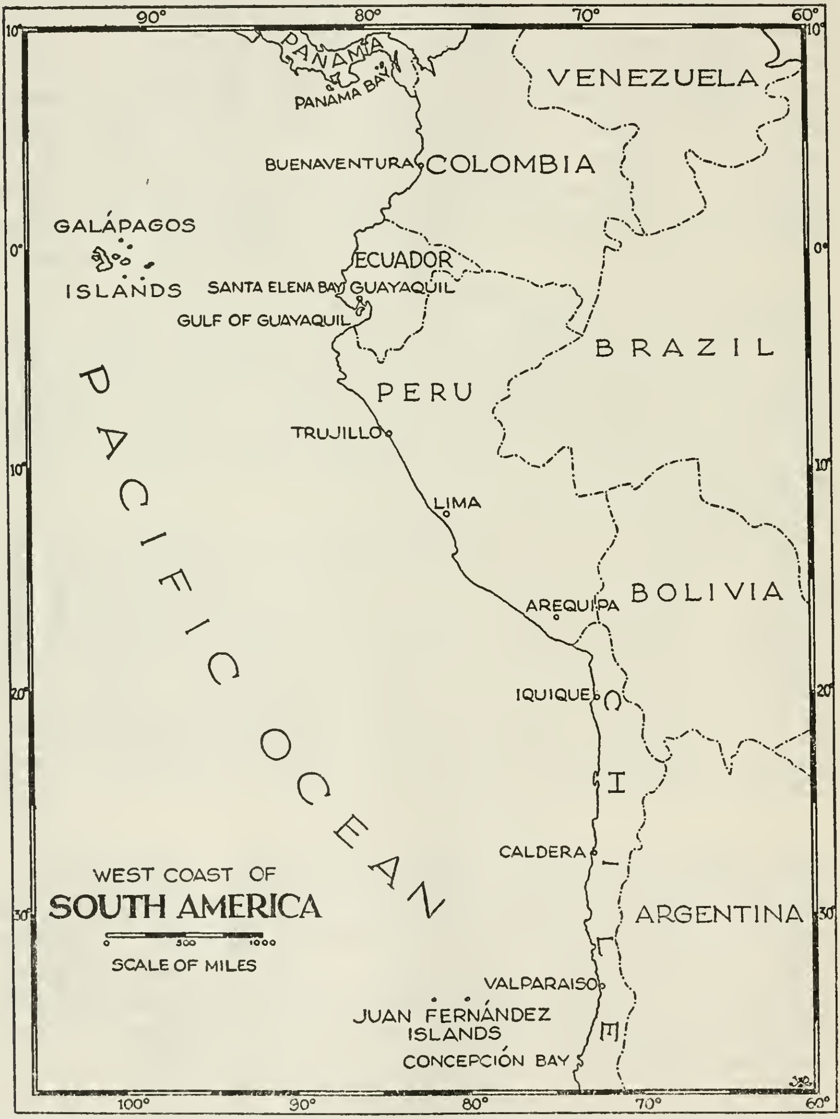
A publication entitled "The Fisheries and Guano Industry of Peru," by R. E. Coker (see bibliography), also deals extensively with the fisheries. This paper, like the one cited in the preceding paragraph, contains a discussion of the temperature of the shore waters of Peru, which generally seem to be lower along most of the coast than on coasts elsewhere in the same latitude. The reason or reasons for the low temperature, which apparently prevails only near shore, have been discussed also by several other investigators, as stated elsewhere, but complete agreement is lacking.

SCOPE OF THE CATALOG

The catalog is limited to the shore fishes of Peru. Nevertheless, a few species generally classed as deep-sea fishes are included because they were taken at the surface and rather near the shore. Also diagnostic characters have been supplied for a few species of widely distributed fishes, such as the sailfish and marlin, of which no specimens from Peru were at hand and which have not been definitely recorded from Peru, though they undoubtedly occur there at times.

SPECIMENS EXAMINED

Through the courtesy of its officials the very extensive ichthyological collections of the U. S. National Museum have been available to me for comparison and study. The principal collection from Peru, and by far the largest one, consisting of about 2,148 specimens, was furnished by the Mission sent to Peru in 1941 by the Fish and Wildlife Service. Another important collection studied, which already had served as the basis for a bulletin by Evermann and Radcliffe (1917), was made in Peru in 1907 and 1908 by Dr. R. E. Coker, then a biologist with the U. S. Bureau of Fisheries, on detail with the Peruvian Govern-


90°
80°
70°
60°
10°
0°
10°
20°
30°
100°
90°
80°
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60°
PANAMA
PANAMA BAY
VENEZUELA
BUENAVENTURA
COLOMBIA
GALÁPAGOS
ISLANDS
ECUADOR
SANTA ELENA BAY
GUAYAQUIL
GULF OF GUAYAQUIL
BRAZIL
PERU
TRUJILLO
LIMA
PACIFIC OCEAN
AREQUIPA
BOLIVIA
IQUIQUE
CHILE
CALDERA
ARGENTINA
VALPARAISO
JUAN FERNÁNDEZ
ISLANDS
CONCEPCIÓN BAY
WEST COAST OF
SOUTH AMERICA
0
500
1000
SCALE OF MILES

Figure 1.—Map of west coast of South America, showing ports, islands, bays, and places mentioned in the text under range of distribution of species.

ment, as already stated. These two principal collections were augmented by specimens obtained sometime between 1838 and 1942 by the United States Exploring Expedition (often referred to as the Wilkes Expedition), by the *Albatross* in 1888, by Dr. W. L. Schmitt in 1926, and by miscellaneous collectors.

The localities at which specimens were obtained are named in the accounts of the species, and the principal collecting stations are shown on the accompanying maps (figs. 1 and 2).

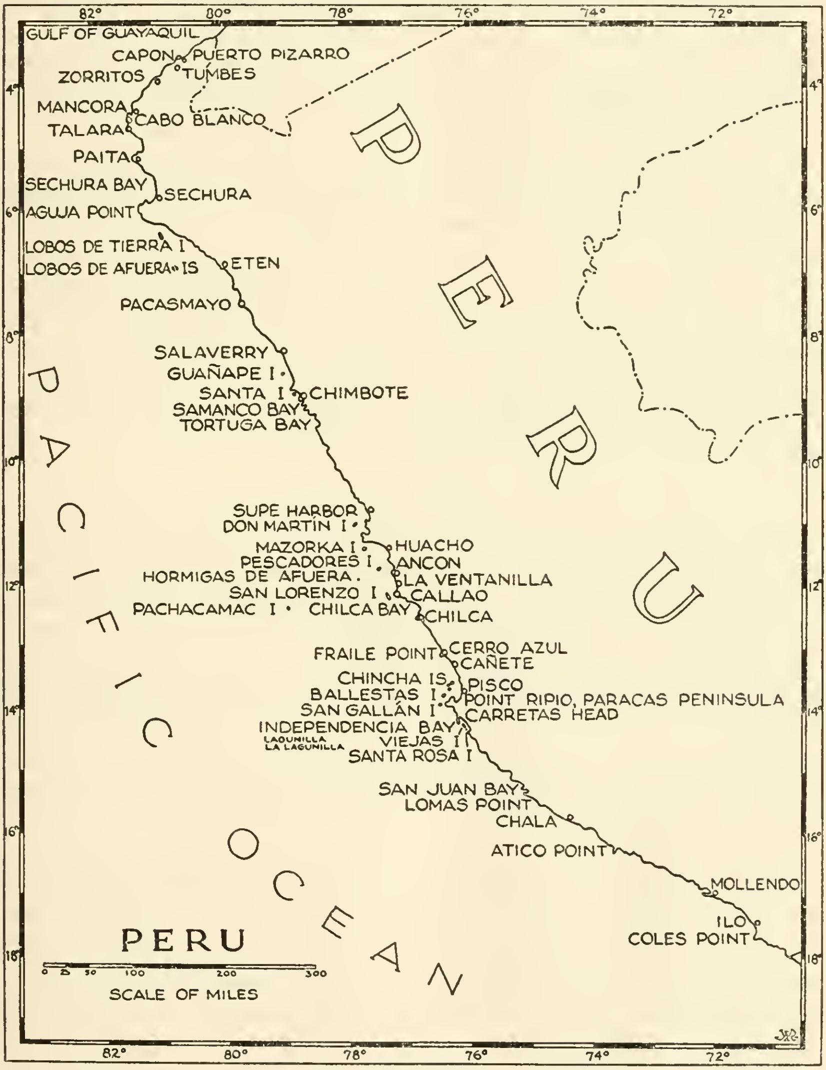
82°
80°
78°
76°
74°
72°
4°
6°
8°
10°
12°
14°
16°
18°
GULF OF GUAYAQUIL
CAPON
PUERTO PIZARRO
ZORRITOS
TUMBES
MANCORA
CABO BLANCO
TALARA
PAITA
SECHURA BAY
SECHURA
AGUJA POINT
LOBOS DE TIERRA I
LOBOS DE AFUERA IS
ETEN
PACASMAYO
SALAVERRY
GUAÑAPE I
SANTA I
CHIMBOTE
SAMANCO BAY
TORTUGA BAY
SUPE HARBOR
DON MARTIN I
MAZORKA I
HUACHO
PESCADORES I
ANCON
HORMIGAS DE AFUERA
LA VENTANILLA
SAN LORENZO I
CALLAO
PACHACAMAC I
CHILCA BAY
CHILCA
FRAILE POINT
CERRO AZUL
CAÑETE
CHINCHA IS
PISCO
BALLESTAS I
POINT RIPIO, PARACAS PENINSULA
SAN GALLÁN I
CARRETAS HEAD
INDEPENDENCIA BAY
LAGUNILLA
LA LAGUNILLA
VIEJAS I
SANTA ROSA I
SAN JUAN BAY
LOMAS POINT
CHALA
ATICO POINT
MOLLENDO
ILO
COLES POINT
PERU
PACIFIC OCEAN
PERU
0 25 50 100 200 300
SCALE OF MILES

Figure 2.—Map of coastal Peru showing the location of the larger cities and important collecting stations.

The extensive collections from Panama Bay and from Baja California in the U. S. National Museum have been used freely and have proved very valuable in the study of the variation and relationship of many species discussed in this catalog.

ACKNOWLEDGMENTS

Most excellent cooperation, often direct help, and innumerable courtesies were extended to me by my fellow workers in ichthyology, and by many other friends. My sincere appreciation and deep gratitude are hereby expressed to everyone who has contributed to the prosecution of this work, which I can only hope will prove worthy of the efforts expended on it. To the secretary of the Smithsonian Institution, Dr. Alexander Wetmore; to the head curator of biology in the U. S. National Museum, Dr. W. L. Schmitt; and to the curator of fishes in the same institution, Dr. L. P. Schultz, in whose division the catalog was prepared, I am deeply indebted. Without constant use of the national collections the work of necessity would have been less complete. To M. J. Lobell, who as biologist of the Mission to Peru collected most of the specimens furnished by the Mission and whose field notes concerning the specimens were placed at my disposal, a word of commendation is due. Miss Jane W. Roller prepared the drawings of the new species described and assisted the author in many other ways, and Luis Revas kindly checked the local names.

EXPLANATIONS

In the sequence of the families the British Museum (Natural History) classification (see Regan, *in* Encyclopaedia Britannica, ed. 14, vol. 9, 1929, pp. 305–328), except for minor changes, has been followed.

Synonymies and references.—No attempt has been made to provide complete synonymies. However, a reference to the original description of each species, together with the type localities, is included. All publications containing records of Peruvian fishes that have come to my attention have been cited. Furthermore, a work of a general nature containing fairly complete synonymies generally also has been cited for each species.

Under the synonymies, as well as in the text, references have been cited by giving the last name of the author or authors, the year of publication, and generally the page number. The complete references are given in the Bibliography. With each reference the localities furnishing the basis for the record are listed, followed by a few words in parentheses, which in a general way show what is contained in the account cited. If only a name is given in the publication cited, without comments of importance, parenthetical remarks are omitted.

The local names used either were furnished by the Mission or were taken from publications on Peruvian fishes.

Sequence of characters used in the descriptions.—The sequence of characters used in the descriptions is fairly uniform. That is, the various characters commonly described, if mentioned at all, are named in the same order in all the descriptions. In general, the shape of the body is mentioned first. Next, the head is described; then the characters about the head, such as the snout, eye, interorbital, mouth, teeth, and gill rakers, are defined. Next, the lateral line, the scales, the fins, and finally the color are described. This uniform sequence was carried out for the convenience of the student, who in using the catalog should soon learn where to look for the description of any particular character he may wish to check.

Specimens examined.—The number and size of the specimens of each species used in preparing the descriptions invariably have been stated. It seemed desirable to give this information, as the student thereby, in a measure at least, may judge the value of the variations given, for obviously small or large specimens alone of any one species will not show the usual variations within that species. Nor will a few specimens, regardless of size, provide so true a range of variations as a large series of various lengths.

Measurements, proportions, abbreviations, and enumerations.—The proportions used in the descriptions were obtained by making all measurements with vernier calipers, and the divisions with a slide rule. The proportions given are mostly divisions either of the *standard length* or of the head. The standard length is the distance between the anterior extremity of the head and the base of the caudal, that is, the end of the vertebral column as near as it may be determined without dissection. Proportions given merely as "in length" mean in the standard length. Proportions given as "in head" apply to the distance between the anterior extremity of the head and the most distant part of the bony margin of the opercle. Any deviation from the customary rule in making the measurements and in obtaining the proportions, as set forth in the preceding sentences, is explained in the descriptions.

The proportions pertaining to the eye are based on its horizontal diameter; the length of the snout on the distance between its anterior tip (whether composed of its own tip or that of the upper jaw) to the anterior rim of the orbit; the "interorbital" on the distance between the margins of the bone or bones between the middle of the eyes; the interorbital space on the distance between the upper margins of the eyes; the maxillary on the distance between the median point of the upper jaw to the posterior extremity of the maxillary bone; the proportions pertaining to the caudal peduncle are based on its least depth; and those of depth are based on the greatest depth of the body.

Some abbreviations have been adopted for the purpose of saving space. The expression "Head 3.1 to 3.5; depth 2.8 to 3.2" signifies that the head is contained 3.1 to 3.5 times and the depth 2.8 to 3.2 times in the length (that is, in the standard length). "Eye 5.6 to 5.9; snout 3.3 to 3.7" means that the diameter of the eye is contained 5.6 to 5.9, and the length of the snout 3.3 to 3.7 times, in the head. Other proportions are similarly stated. If there is any departure from this common practice, it is explained in the text.

The names of the fins, when enumerations of rays are given, have been abbreviated by using their first letter. The formula D. VIII, 12, for example, signifies that the dorsal fin is single and that it consists of 8 spines and 12 soft or articulated rays. If the formula is written D. VII–I, 12, the fin is composed of 2 separate parts, or of 2 fins, the first consisting of 7 spines, and the second of 1 spine and 12 soft rays. Similarly, V. I, 5 means that the ventral fin has 1 spine and 5 soft rays. As shown in the examples of the fin-ray formulae offered, the spines are indicated by Roman and the soft or articulated rays by Arabic numerals. In some species the last ray of the dorsal and anal is deeply divided. However, it was counted as single, unless the division was complete, in the numbers given in this work.

The enumerations of gill rakers sometimes are stated with 2 numerals, with a plus sign between them, thus "7+16." This formula signifies that in this instance the specimen had 7 rakers on the upper and 16 on the lower limb of the first gill arch. The number of scales occasionally is stated thus, "8—76", which signifies that the specimen examined had 8 complete rows of scales between the lateral line and the first ray of the dorsal, and 76 vertical or oblique series, running upward and backward from the lateral line, counted just above the lateral line. Sometimes it was necessary or desirable to depart from this usual procedure, and of course some scaly fish have no lateral line. In such cases the method of counting is explained in the descriptions.

The use of keys.—The keys offered are intended to provide ready means for identification. No attempt has been made to indicate natural characters or relationships, and only the families, genera, and species occurring in Peru, with few exceptions, have been considered. It is always advisable for the student using the keys to read the description to which the keys direct him before coming to a conclusion as to the correct identification of the material in hand.

When using the keys first determine to which major group, designated as "*a*" and "*aa*", the specimen in hand belongs. Then take up in the regular order the letters representing the smaller groups under the major group. If the specimen does not agree with the characters mentioned after the single letter, try the double letter and rarely a triple letter, ignoring all the intervening subdivisions. After a little practice the beginner very probably will discover that the keys are not difficult to use.

RANGE AND DISTRIBUTION OF SPECIES

Among the 264 species of fishes described in this catalog, as belonging to the fauna of Peru, 15 may be considered more or less cosmopolitan in their distribution, and are not included in the numbers given subsequently. At least 128 of the species herein recorded from Peru range northward of that country, and only 48 rather certainly range southward into Chile.[1] On the basis of present knowledge 71 species, including most of the new ones herein described, occur only in Peru.

Among the species known northward of Peru, 3 range only as far as Ecuador, 1 as far as Colombia, 34 apparently range as far north as Central America (mostly only to Panama Bay), and 75 range to, or rarely beyond, Baja California. The last-mentioned group contains 8 species to date not taken at localities intermediate of Baja California and Peru.

The number of species in Peru, according to present information, diminishes rather rapidly southward. For example, 177 species are recorded herein from extreme northern Peru, that is, north of 6°56′ S. (including Lobos de Afuera Island); 102 species from the coast, and nearby islands, between latitudes 6°56′ S. and 12°04′ S. (including Callao); and 88 species are listed from the Peruvian coast, and nearby islands, south of latitude 12°04′ S.

The effect of the fishing (collecting) effort along the different sections of the coast on the number of species taken is not well known. It is quite certain, however, that more collectors have taken specimens at Callao than at any other locality along the coast. It may be assumed then that the general vicinity of Callao has been sampled more thoroughly than any other along the coast of Peru. Yet the number of species known from there and northward, about to Lobos de Afuera Island, is much smaller than the number known from extreme northern Peru, as shown in the preceding paragraph. It is judged from the literature and the comparatively small collections from southern Peru that the collecting effort along that section of the coast has not been so great as northward. However, sufficient collecting seems to have been done to show rather conclusively that the decline in the number of species inhabiting the shores continues into southern Peru.

Although notably fewer coastal species are known from southern than from northern Peru, they are for the most part the same. In fact, of the 88 species reported in this catalog from southern Peru (south of Callao), only 15 are not yet known also from northern Peru. As indicated in a preceding paragraph, most of the species reported from Peru range northward of that country. On the other hand, it has been shown that comparatively few range beyond the southern boundary of Peru. It perhaps is significant, also, that the abundant family Nototheniidae of the South Temperate coasts of America has not to date been listed from Peru. Neither are the Gadidae, Macrouridae, and Zoarchidae, all found in Chile, represented among the Peruvian fishes. These facts seem to show that the shore fishes of Peru are predominantly tropical in character.

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[1] It is necessary to use indefinite terms in discussing the range, as in some instances definite localities are missing, and in others the species are in doubt. It should be understood, also, that the same species in some instances has been included in two or more of the numbers given. For example, most of the 49 Peruvian species occurring in the Galápagos also are recorded from Panama Bay, and some of them from Baja California.

As Peru lies almost wholly between latitudes 3° and 17° S., a tropical fish fauna would be expected there. However, winds and currents have been said to affect profoundly the temperature of the water, at least along the greater part of the coast, and near the shore. This matter will not be treated here, as it has been discussed at considerable length in the report of the Mission (1943, pp. 200–232), and prior to that by R. E. Coker (1910), R. C. Murphy (1923), and others. According to the more recent data, the cold water seems to be near shore only and is caused by an upwelling of cold water (at least according to Dr. Murphy), which in turn is caused by winds and currents. Whatever the extent of the cold water may be along the shore, it is not great enough to exclude all tropical fishes.

The present study, then, shows that although the fish fauna of Peru is predominantly tropical, a considerable number of warm-water-inhabiting species, known from Central America and northern Peru, do not range into southern Peru. It was stated by Nichols and Murphy (1922, p. 513) that the Peruvian fish fauna has its "closest faunal affinities with the Californias" and that the "shore-fish fauna is subtropical or temperate rather than tropical in character." There are, indeed, certain affinities between these faunas, for it has been shown that about 75 of the Peruvian species occur also in and beyond Baja California. However, all except 8 of these are recorded from Central America also. It seems correct to say, in the light of further studies, that the similarity of the fish faunas of Peru (exclusive of the extreme northern part of that country, which is strictly tropical) and Baja California consists chiefly in the support of those tropical species which tolerate a somewhat lower temperature than some of their associates of Central America and northern South America. In that sense the fishes of Peru, as well as those of Baja California, perhaps may be considered "subtropical."

DEFINITIONS OF TECHNICAL TERMS USED IN THE TEXT[3]

Adipose fin.—A fleshy fin on the back, behind the dorsal fin, without rays, occasionally with a spine, present in most catfishes, lizardfishes, etc.

Articulate.—Jointed; said of soft rays bearing articulations.

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[3] The definitions are intended to define the use of the terms in Ichthyology only. The reader is referred to figure 3 on page 12 for additional terms used in describing external structures of fishes.

Barbel.—An elongate, fleshy projection, or "whisker," usually about the head.

Branchiae.—The gills.

Branchial.—Pertaining to the gills, as branchial arches, the bony supports of the gill filaments.

Branchiostegals.—Bony rays or arches under the head and below the opercular bones, supporting the branchiostegal membranes.

Cirri.—Dermal fringes.

Claspers.—Organs attached to the ventral fins in male sharks, rays, etc.

Compressed.—Flattened from side to side; said of fishes that are deeper than broad.

Ctenoid.—With rough edges; said of scales with spinous or pectinate posterior edges.

Cycloid.—With smooth edges; said of scales with smooth posterior edges.

Dentary.—The principal bones of the lower jaw or mandible, usually bearing teeth.

Denticles.—Little teeth, such as occur on the skin of a shark.

Depressed.—Flattened vertically; said of fishes that are broader than deep.

Distal.—Remote from the place of attachment.

Emarginate.—Slightly forked or notched; often used in describing the shape of the caudal fin.

Falcate.—Scythe-shaped; long, narrow, and curved; sometimes used to describe the shape of the pectoral fin.

Filament.—A slender, threadlike structure.

Fontanel.—An opening between the bones of the skull.

Gill rakers.—A series of bony projections placed along the inner edge of the branchial or gill arch.

Imbricate.—Overlapping; said of scales that overlap like shingles on a roof.

Isthmus.—The area between the lower part of the gill opening, or the anterior part of the chest, usually more or less pointed anteriorly.

Jugular.—Pertaining to the throat; said of ventral fins if attached in advance of the pectorals.

Keeled.—Having a ridge, as along the side of the tail in some groups of fishes.

Lateral line.—A series of pores along the side, containing sense organs.

Mandible.—Lower jaw.

Maxillaries.—The outer bones of the upper jaw, joined to the premaxillaries in front of them, sometimes bearing teeth.

Myomeres.—Muscle segments or rings.

Nape.—Pertaining to the neck, that is, the region immediately behind the head.

Nictitating membrane.—An inner eyelid, as in some sharks among the fishes.

Nuchal.—Pertaining to the nape or neck.

Obsolete.—Faintly marked; scarcely evident.

Ocellus.—An eyelike spot; a dark spot with a light border.

Opercle.—The thin bone on the side of the head, covering the gills.

Palatines.—A pair of bones in the roof of the mouth, extending outward and backward from the vomer, sometimes bearing teeth.

Pharyngeal bones.—Bones behind the gills and at the beginning of the esophagus, often bearing teeth.

Premaxillaries.—The bones, one on each side, forming the front of the upper jaw; usually bearing teeth.

Preopercle.—A thin bone lying on side of head just in front of the opercle.

Preorbital.—The bone lying just in front of and somewhat below the eye.

Protractile.—Capable of being drawn forward; said of the premaxillaries, if not stationary.

Pseudobranchiae.—Small gills developed in some fishes on the inner side of the opercle.

Pterygoids.—A pair of bones in the roof of the mouth, behind the palatines, sometimes bearing teeth.

Pyloric caeca.—Blind appendages connected with the pyloric or lower end of the stomach.

Ray.—A bony or cartilaginous support of a fin; rays are spiny or soft.

Scute.—An external bony or horny plate.

Spiracles.—A pair of openings in the dorsal surface of the head in some sharks and skates.

Standard length.—Distance from tip of snout or tip of lower jaw, whichever is the longer, to base of caudal, or end of last vertebra (see fig. 3).

Suborbital.—The bone just below the eye.

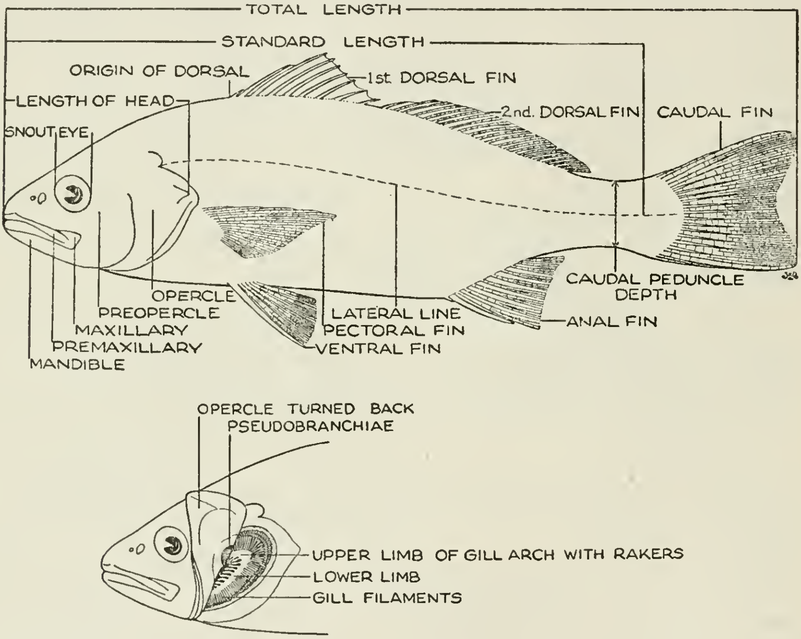
TOTAL LENGTH
STANDARD LENGTH
ORIGIN OF DORSAL
1st. DORSAL FIN
LENGTH OF HEAD
2nd. DORSAL FIN
CAUDAL FIN
SNOUT
EYE
OPERCLE
PREOPERCLE
MAXILLARY
PREMAXILLARY
MANDIBLE
LATERAL LINE
PECTORAL FIN
VENTRAL FIN
CAUDAL PEDUNCLE DEPTH
ANAL FIN
OPERCLE TURNED BACK
PSEUDOBRANCHIAE
UPPER LIMB OF GILL ARCH WITH RAKERS
LOWER LIMB
GILL FILAMENTS

FIGURE 3.—Diagram of the corbina (*Sciaena gilberti* Abbott), showing external parts and the name of each used in the descriptions and keys.

Suborbital stay.—A bone extending across the cheek, to or toward the preopercle; present in a few groups only.

Supplemental maxillary.—A small bone placed on the upper margin of the maxillary, if present.

Symphysis.—The tip of the chin; the point of juncture of the two bones of lower jaw.

Synonymy.—A list of technical names applied to a genus or species.

Tenaculum.—An adhesive structure, as in the claspers of male sharks and chimaeras.

Thoracic.—Pertaining to the thorax; said of the ventral fins, if attached more or less below the pectoral fins.

Trenchant.—Compressed to a sharp edge.

Tritors.—Teeth with grinding surfaces.

Type.—The particular specimen designated to represent the species by the original describer (holotype); other specimens studied at the same time and used with the holotype in preparing the original description (paratypes); also the species on which a genus is based (genotype).

Type locality.—The particular place at which the type of a species was collected.

Ventral plates.—Bony plates lying on the belly; only occasionally present.

Vertical fins.—The fins placed on median line of body, that is, the dorsal, caudal, and anal fins; used to distinguish them from the paired fins, namely, the pectoral and ventral fins.

Villiform.—Said of minute, crowded teeth in bands or patches.

Vomer.—A bone in the front part of the roof of the mouth, lying immediately behind the premaxillaries, sometimes bearing teeth.

SYSTEMATIC CATALOG

KEY TO THE FAMILIES

I. Leptocardii (lancelets): Body elongate, compressed; mouth a mere slit; skeleton cartilaginous; skull undeveloped; gill openings consisting of numerous slits .... **Branchiostomidae** (p.21)

II. Selachii (sharks, skates and rays, and chimaeras): Body variously shaped; skeleton cartilaginous; skull imperfectly developed; mouth well formed, with jaws separable from the skull, or the upper one more or less coalesced with it (in chimaeras); gill openings slitlike, 4 to 7 on each side, or with a single opening on each side leading to 4 slits (in chimaeras); gills attached to skin; males with large claspers attached to ventral fins.

- *a.* Gill openings consisting of 5 to 7 external slits; teeth distinct.
  - *b.* Body usually rounded, typically fishlike, occasionally depressed; gill slits lateral or only partly inferior; pectoral fins sometimes expanded but not continuous with head.
    - *c.* Both dorsal fins provided with a strong spine ... **Heterodontidae** (p.22)
    - *cc.* Dorsal fins without spines.
      - *d.* First dorsal over or behind ventral.
        - *e.* Body slender; size small; teeth of medium size, more or less triangular, often tricuspid; lower lobe of caudal scarcely exserted .... **Scylliorhinidae** (p. 24)
        - *ee.* Body massive; size enormous; teeth small, numerous, subconic; lower lobe of caudal large .... **Rhincodontidae** (p. 26)
      - *dd.* First dorsal well in advance of ventral.
        - *f.* Head greatly depressed, with lateral extensions, more or less hammer-shaped .... **Sphyrnidae** (p. 26)
        - *ff.* Head normally shaped, without lateral extensions.
          - *g.* Gill slits of moderate length, not nearly meeting at midline of throat, one or more slits above base of pectoral; tail without lateral keel............ **Galeorhinidae** (p. 28)
          - *gg.* Gill slits very long, nearly meeting at midline of throat, all in front of pectoral; tail with keel; size very large. **Cetorhinidae** (p. 44)
  - *bb.* Body much depressed; gill slits inferior (or partly lateral as in Squatinidae); pectoral fins greatly expanded, confluent with the head (except in Squatinidae).
    - *h.* Pectoral fins not entirely confluent with head; nostrils situated on front margin of snout .... **Squatinidae** (p. 46)

hh. Pectoral fins confluent with the head and body, forming a more or less definite disk; nostrils situated on ventral side of snout.

i. Tail comparatively thick, usually bearing 2 dorsal fins and a caudal fin; no serrated spine present.

j. Snout not produced; disk broad, subcircular or rhomboidal.

k. Disk subcircular; skin naked, soft and smooth; electric organs present **Torpedinidae** (p. 48)

kk. Disk rhomboidal, skin usually more or less rough, with small spines and larger tubercles; no electric organs **Rajidae** (p. 52)

jj. Snout not produced, tapering; disk more or less triangular. **Rhinobatidae** (p. 50)

ii. Tail slender, usually without a dorsal fin, generally at least with a large serrated spine.

l. Pectoral fins confluent around snout; eyes superior; teeth small, numerous, usually with ridges or small cusps **Dasyatidae** (p. 63)

ll. Pectoral fins ending opposite sides of head, united or free from rostral fins; eyes lateral; teeth large, few, flat, more or less hexagonal, middle ones usually much broader than outer ones **Aetobatidae** (p. 74)

aa. Gill opening single, leading to 4 slits; teeth united, forming bony plates; body compressed; tail slender; proboscis produced into a leaf-shaped flexible appendage **Callorynchidae** (p. 76)

III. Pisces (true fishes): Body variously formed; skeleton bony; skull well developed; mouth well developed, with jaws attached to the skull; gill opening single on each side; gills attached to bony arches; claspers wanting.

a. Eyes on opposite sides of head; both sides of fish pigmented.

b. Ventral fins present.

c. Ventral fins abdominal (that is, attached somewhere to abdomen).

d. Adipose fin present.

e. Body naked; dorsal and pectoral each with a strong spine; maxillary with 1 and chin with 2 or more barbels **Ariidae** (p. 119)

ee. Body covered with scales; fins without spines.

f. Body little if at all compressed, not provided with light organs (photophores) **Synodontidae** (p. 108)

ff. Body compressed, provided with conspicuous light organs, at least on lower part of side.

g. Margin of upper jaw formed by maxillaries and premaxillaries; light organs confined to lower part of side and of head. **Maurolicidae** (p. 105)

gg. Margin of upper jaw formed entirely by narrow premaxillaries; light organs not wholly confined to lower part of side and of head, often present on upper surface of head and of caudal peduncle **Myctophidae** (p. 116)

dd. Adipose fin absent.

h. Dorsal fin single, composed of soft rays only.

i. Snout, both jaws, or lower jaw only, greatly produced; body long, very slender.

j. Snout greatly produced, tubelike, with a small mouth at its tip. **Fistularidae** (p. 150)

jj. Snout not greatly produced, not in form of a tube.

k. Both jaws very long, each with a band of pointed teeth. **Belonidae** (p. 143)

kk. Upper jaw short, lower one very long; no teeth on produced part **Hemiramphidae** (p. 144)

ii. Snout and jaws not produced (in adults); body not very slender, often rather short, compressed.
  l. Pectorals, and sometimes ventrals also, very large, winglike, used as organs for flight ----------- **Exocoetidae** (p. 147)
  ll. Pectorals and ventrals not especially large.
    m. A bony plate present between arms of lower jaw; branchiostegals about 25 to 35------------ **Elopidae** (p. 78)
    mm. Bony plate between arms of lower jaw wanting; branchiostegals about 6 to 15.
      n. Mouth moderate, terminal or more or less superior, generally oblique-------- **Clupeidae** (see also *p''*) (p. 80)
      nn. Mouth large, horizontal, with overhanging, piglike snout. **Engraulidae** (p. 96)
hh. Dorsal fins 2, first composed of spines.
  o. Pectoral in 2 parts, lower part consisting of free filamentous rays. **Polynemidae** (p. 434)
  oo. Pectoral not in 2 parts, without free rays.
    p. Head long; jaws long and strong, provided with strong teeth of unequal size ------------------ **Sphyraenidae** (p. 418)
    pp. Head not especially long; jaws not produced, rather weak; teeth minute or wanting.
      q. First dorsal with 3 to 9 flexible spines; anal with a single weak spine-------------------------- **Atherinidae** (p. 428)
      qq. First dorsal with 4 strong stiff spines; anal with 3 stiff spines (very young with only 2)----------- **Mugilidae** (p. 420)
cc. Ventral fins thoracic or jugular (that is, attached somewhere to the thorax or chest, or under the head).
  r. Ventral fins thoracic, each fin composed of 1 spine and 5 soft rays except in Gempylidae, Merlucciidae, and sometimes Cottidae.
    s. Ventral fins separate and distinct, not forming a sucking disk on chest.
      t. Top of head with a large sucking disk composed of crosswise partitions and a lengthwise septum-------- **Echeneidae** (p. 479)
      tt. Head without a sucking disk.
        u. Jaws, especially the upper one, greatly produced, forming a spike or bill; 2 dorsal fins, first one very long and sometime very high, second very small (large game fishes). **Istiophoridae** (p. 378)
        uu. Jaws not greatly produced; dorsal fin single or double, first one, if separate, usually equal to or shorter than second.
          v. Suborbital with a bony ridge or stay; head partly or wholly encased in spinous bony plates.
            w. Pectoral fins very long, winglike, with the 3 lowermost rays free; dorsal fins 2------------- **Triglidae** (p. 454)
            ww. Pectoral fins only moderately long, not winglike, without free rays; dorsal fin single.
              x. Gill opening wide, extending forward to isthmus; mouth large, wide---------------- **Scorpaenidae** (p. 437)
              xx. Gill opening restricted to side, above base of pectoral; mouth small------------- **Congiopodidae** (p. 456)
          vv. Suborbital stay wanting; head not encased in spinous bony plates.
            y. Gill arches 4, a slit behind fourth.

z. Ventral fin with 1 spine and 5 soft rays.

a′. Scales very small or obsolete; caudal peduncle usually very slender; anal fin similar to second dorsal, though often shorter; caudal fin forked; color usually bright steel-blue to silvery.

b′. Dorsal and anal each followed by 5 to 10 finlets; caudal peduncle with a lateral keel. **Scombridae** (p. 361)

bb′. Dorsal and anal each followed by 1 finlet or none.

c′. Dorsal spines greatly produced, long and filamentous (except in very young). **Nematistiidae** (p. 225)

cc′. Dorsal spines not greatly produced, not filamentous.

d′. Dorsal fin very long, continuous, beginning over nape, with about 50 to 60 rays, without stiff spines__ **Coryphaenidae** (p. 226)

dd′. Dorsal fin shorter, beginning well behind nape, often in two parts, anteriorly generally with stiff spines.

e′. Anal fin preceded by 2 strong separate spines (more or less connected by membrane in young, sometimes obsolete in very old specimens); esophagus without teeth____________ **Carangidae** (p. 202)

ee′. Anal fin not preceded by free spines; esophagus with lateral sacs bearing teeth internally______ **Stromateidae** (p. 416)

aa′. Scales larger; caudal peduncle not especially slender; anal fin various, often shorter than dorsal; caudal fin not always forked; color variable, generally not bright steel-blue to silvery.

f′. Chin with a pair of long barbels; dorsal fins 2, the first with 6 to 8 spines_____ **Mullidae** (p. 311)

ff′. Chin without barbels.

g′. Anal fin long, with 1 or 2 feeble spines and about 22 to 30 soft rays; dorsal long, continuous, with about 6 to 9 spines and 22 to 26 soft rays; scales small, about 110 to 128 in lateral series.

h′. Teeth in jaws fairly strong; upper jaw with a strong canine posteriorly; teeth wanting on vomer and palatines; dorsal with about 8 or 9 spines and about 22 to 26 soft rays. **Malacanthidae** (p. 197)

hh′. Teeth in jaws smaller; canines in upper jaw wanting; teeth present on vomer and palatines; dorsal with about 5 to 7 spines and about 25 to 30 soft rays. **Mugiloididae** (p. 355)

gg′. Anal shorter, with 1 to 3 spines, or rarely none, and about 6 to 20 soft rays; dorsal fin usually notched, sometimes in 2 parts, soft part with fewer than 22 rays (except in some Sciaenidae).

i'. Lateral line extending to end of caudal fin.

j'. Anal with 3 strong spines and about 6 or 7 soft rays; dorsal in 2 parts; supraclavicle serrate........ **Centropomidae** (p. 228)

jj'. Anal with 1 or 2 spines; dorsal fin deeply notched or in 2 parts; supraclavicle not serrate............ **Sciaenidae** (p. 258)

ii'. Lateral line not extending on caudal fin (in Peruvian species).

k'. Anal fin composed entirely of soft rays (about 15 in Peruvian species); dorsal fin in 2 parts, the first with spines only (in Peruvian species)... **Cottidae** (p. 458)

kk'. Anal with 2 or 3 well-developed spines (in Peruvian species).

l'. Anal with 2 spines and about 8 or 9 soft rays; dorsal fin in 2 parts, the first with about 6 spines (in Peruvian species), scales large, about 23 to 27 in lateral series (in Peruvian species).
Apogonidae (p. 193)

ll'. Anal with 3 spines; dorsal continuous, or deeply notched, rarely in 2 parts, generally with more than 6 spines.

m'. Gill membranes united with the isthmus; body short, deep, compressed, depth notably exceeding half length; teeth brushlike.

n'. Dorsal fin deeply notched or in 2 parts; scales rather small, about 50 to 100 in lateral series.
Ephippidae (p. 318)

nn'. Dorsal fin continuous, not deeply notched; scales larger, about 30 to 40 in lateral series (in Peruvian species).
Chaetodontidae (p. 320)

mm'. Gill membranes free from the isthmus; body more elongate, depth generally not exceeding half length; teeth not brushlike.

o'. Premaxillaries excessively protractile, premaxillary spine extending to interorbital just underneath skin; scales large, about 35 to 45 in a lateral series (in Peruvian species).
Gerridae (p. 237)

oo'. Premaxillaries not excessively protractile; scales generally smaller, usually more than 45 in a lateral series.

p'. Teeth in jaws fused, forming a continuous plate or beak.
Oplegnathidae (p. 322)

pp'. Teeth in jaws separate and distinct.

- *q'*. Teeth on anterior part of jaws at least compressed, more or less incisorlike, sometimes notched; no molars.
  - *r'*. Dorsal fin long, continuous, the spines becoming progressively longer, or at least not decreasing notably in length, with about 10 to 15 spines and 15 to 18 soft rays__**Kyphosidae** (p. 315)
  - *rr'*. Dorsal fin deeply indented or in 2 parts, posterior spines decreasing greatly in length, with about 15 to 17 spines and 18 to 20 soft rays. **Aplodactylidae** (p. 324)
- *qq'*. Teeth in anterior part of jaws not compressed or incisorlike (in Peruvian species); molars present or absent.
  - *s'*. Several of lower rays of pectoral simple, with free tips; dorsal fin single, deeply notched, with about 16 to 19 spines and 20 or more soft rays. **Cheilodactylidae** (p. 326)
  - *ss'*. Lower rays of pectoral not simple or free at tips.
    - *t'*. Teeth on sides of lower jaw consisting of low blunt molars; maxillary slipping under preorbital; preopercle with smooth margin. **Sparidae** (p. 312)
    - *tt'*. Teeth on sides of lower jaw not molarlike, all more or less pointed.
      - *u'*. Maxillary not sheathed by preorbital; opercle ending in 1 or 2 flat spines. **Serranidae** (p. 159)
      - *uu'*. Maxillary sheathed in large part by the preorbital; opercle without spines.
        - *v'*. Teeth in jaws usually unequal, some of them more or less

caninelike; teeth usually present on vomer and palatines. **Lutianidae** (p. 229)

vv'. Teeth in jaws rather uniform in size; no canines; no teeth on vomer and palatines. **Pomadasidae** (p. 242)

zz. Ventral fin not definitely with 1 spine and 5 soft rays, having either a reduced or an increased number of rays.

w'. Ventral fin reduced; dorsal and anal each followed by several finlets----------- **Gempylidae** (p. 359)

ww'. Ventral fin with 7 rays; dorsal fins 2; anal single; no finlets-------------- **Merlucciidae** (p. 157)

yy. Gill arches 3 or 3½, slit behind last one small or obsolete.

x'. Lateral line ending under soft part of dorsal; nostrils with a single opening on each side; scales firm, ctenoid---------------- **Pomacentridae** (p. 331)

xx'. Lateral line complete though sometimes interrupted; nostrils with 2 openings on each side; scales rather thin, not ctenoid.

y'. Teeth mostly separate and distinct, some of anterior ones enlarged, forming canines--**Labridae** (p. 342)

yy'. Teeth coalesced at least at base, forming a more or less continuous plate--------- **Scaridae** (p. 350)

ss. Ventral fins forming a sucking disk or at least a part of it.

z'. Dorsal fin single, consisting of soft rays only; ventral fins forming sides of a large sucking disk situated between them. **Gobiesocidae** (p. 489)

zz'. Dorsal fin continuous or in 2 parts, anteriorly with spines; ventral fins united, forming a sucking disk.

a''. Dorsal fin single, continuous; caudal connected with dorsal and anal----------------------- **Gobioididae** (p. 381)

aa''. Dorsal fin in 2 parts, or at least deeply notched; caudal separate from dorsal and anal--------- **Gobiidae** (p. 380)

rr. Ventral fins jugular, being attached under head, or at least well in advance of pectorals, usually close together.

b''. Carpal bones elongate, forming an arm or wrist for the support of pectoral fin; first dorsal with 1 to 4 separate spines, first bristlelike, with a membranous bulb or "bait" at tip.

c''. Head very broad, depressed; mouth excessively large; gill opening large, behind wrist of pectoral--**Lophiidae** (p. 499)

cc''. Head compressed; mouth only moderately large; gill opening very small, at or below wrist of pectoral. **Antennariidae** (p. 501)

bb''. Carpal bones not elongate, not forming a wrist for support of pectoral fin.

d''. Dorsal and anal fins very long, without definite spines, continuous with the caudal fin; ventral fin reduced to 1 or 2 rays.

e''. Body somewhat eel-shaped, ventral fins inserted at chin. **Ophidiidae** (p. 412)

ee''. Body elongate, not eel-shaped, compressed; ventral fins inserted on isthmus--------------- **Brotulidae** (p. 410) *dd''*. Dorsal fin short to moderately long, with spines or with simple rays; ventral fins with a spine and 2 to 5 soft rays.

f''. First dorsal with only about 2 to 7 spines (in Peruvian species); head large, depressed in Batrachoididae and Uranoscopidae; mouth generally superior.

g''. Gill openings restricted to sides; head broad, depressed; ventral fin with a spine and 2 or 3 soft rays. **Batrachoididae** (p. 494)

gg''. Gill openings wide, the membranes nearly or quite free and separate from isthmus.

h''. Ventral with a spine and 5 soft rays; head depressed, at least partly covered with bony plates; soft part of dorsal and anal each with about 12 to 15 rays. **Uranoscopidae** (p. 357)

hh''. Ventral with a spine and 3 soft rays; head more or less compressed, without bony plates; soft part of dorsal and anal each with about 25 to 45 rays. **Dactyloscopidae** (p. 408)

ff''. First dorsal with about 10 to 30 spines or simple rays (in Peruvian species); head not especially large, generally compressed.

i''. Spinous and soft parts of dorsal about equal in length, or latter slightly the longer, with 12 spines and 14 to 17 soft rays (in Peruvian species); premaxillaries not protractile; teeth in jaws in a single principal series, not followed by a band of small teeth__**Blenniidae** (p. 383)

ii''. Spinous part of dorsal much longer than soft part, with 18 to 25 spines or simple rays and 11 to 17 soft rays (in Peruvian species); premaxillaries generally protractile; teeth in jaws in an outer series, followed by a band of small pointed teeth_______________ **Clinidae** (p. 394)

bb. Ventral fins wanting.

j''. Body long slender, snakelike; premaxillaries rudimentary or wanting.

k''. Caudal fin developed, confluent with dorsal and anal; tongue wanting; nostrils behind upper lip___________ **Muraenidae** (p. 129)

kk''. Caudal fin wanting, tail extending beyond dorsal and anal fins; tongue present; one or both nostrils in upper lip. **Ophichthyidae** (p. 135)

jj''. Body not snakelike.

l''. Snout greatly produced, forming a tube with a very small mouth at tip; body encased in bony rings__________ **Syngnathidae** (p. 152)

ll''. Snout not produced into a tube; body not encased in bony rings.

m''. Upper jaw greatly produced, forming a sword; caudal peduncle slender, with a strong lateral keel (very large sport and game fishes)________________________________ **Xyphiidae** (p. 378)

mm''. Upper jaw not produced into a sword.

n''. Body very elongate, strongly compressed, band-shaped, coming to a point posteriorly; dorsal and anal fins very long; caudal fin wanting________________________ **Trichiuridae** (p. 360)

nn''. Body not very elongate, not band-shaped; dorsal short.

o''. Dorsal fin single, with soft rays only.

p''. Mouth moderately large; teeth small or wanting; gill opening large, membranes not connected, free from isthmus; caudal forked; body with normal scales; not capable of inflation____________ **Clupeidae** (see also *n*) (p. 80) *pp''*. Mouth small; teeth in jaws forming a continuous plate; body not with normal scales, generally naked or with prickles; capable of great inflation. **Tetraodontidae** (p. 484)

oo''. Dorsal fins 2, the first consisting of 3 spines; body covered with rather large bony scales, forming a coat of mail; a large median ventral spine present.. **Balistidae** (p. 480)

aa. Eyes and pigment restricted to one side.

q''. Preopercle with a free margin; eyes moderate, well separated; eyes and pigment normally on left side................. **Bothidae** (p. 460)

qq''. Preopercular margin not free, being hidden by skin and scales; eyes very small and very close together.

r''. Body short, more or less oval; eyes and pigment on right side; caudal free from dorsal and anal................. **Soleidae** (p. 472)

rr''. Body elongate, more or less tongue-shaped; eyes and pigment on left side; caudal continuous with dorsal and anal. **Cynoglossidae** (p. 473)

Family BRANCHIOSTOMIDAE: Lancelets

Body elongate, compressed, pointed at each end, deepest in middle, naked; eye rudimentary; mouth inferior, an elongate median fissure, surrounded by rather long stiff cirri; dorsal fin represented by a low fold on the back; and usually also represented by at least a rudimentary fold; gonads arranged in pairs of pouches along the ventral surface of the body in a large pouch formed by a continuation of the body wall forming free folds, leaving an opening along the ventral surface; color nearly or entirely wanting, translucent in life. A single genus and species occurs in the Peruvian collections studied.

Genus BRANCHIOSTOMA Costa, 1834

Rostral process not especially long, represented only by a dermal flap. Other characters are sufficiently indicated in the description of the family.

These lancelets usually occur on sandy shores in warm water. Some evidence has been found indicating that they embed themselves mostly during the day and become active at night. The anus is consistently situated on the left side of the anal fold in rather numerous specimens examined of three different species from the Pacific coast of the Americas.

BRANCHIOSTOMA ELONGATUM Sundevall

Branchiostoma elongatum Sundevall, 1852, p. 147, Chincha Island, Peru (original description).—Andrews, 1893, pp. 233, 238, 242.—Jordan and Evermann, 1896, p. 4, footnote (diagnosis, relationship).—Regan, 1913, p. 278, Lobos de Tierra, Peru (specimens from 5 to 8 fathoms).—Fowler, 1941a, p. 219 (references).

Muscular rings, or myomeres, 79 to 82 in number, 28 to 30 of these behind gonad-bearing part of body; rostral prolongation a broad dermal flap; dorsal and anal fin folds rather broad, continued around the tail, the anal fold continued forward to gonadal pouch without diminishing perceptibly in width, both folds with numerous not accurately countable rudimentary rays; vent situated about twice as far from gonadal pouch as from tip of tail; portion of body behind gonadal pouch, or behind origin of anal, 3.5 to 3.8 in total length.

The description is based on six specimens, 37 to 64 mm. long, dredged on bottom with dead shells at Don Martín Island by the Mission, and one specimen, 41 mm. long, taken at Chincha Island by W. L. Schmitt. These specimens were compared with others from Valparaiso, Chile (U.S.N.M. No. 70716), and from the Galápagos Islands (U.S.N.M. No. 119816), with which they seem to be identical. They were also compared with several lots of specimens from California and from Panama Bay, from which they differ in the more numerous myomeres, the more anterior position of the vent, and the larger rostral flap.

Range.—Coasts of Peru and Chile, at least as far south as Valparaiso, and the Galápagos Islands.

Family HETERODONTIDAE: Bullhead Sharks

Body short, heavy anteriorly, tapering strongly posteriorly; head short, broad; eye lateral, small, no nictitating membrane, protected above by a very heavy ridge; spiracle small, below posterior part of eye; mouth near rim of snout, with lobed lips; teeth anteriorly more or less tricuspid, ridged grinders posteriorly; nostrils connected with the mouth by grooves; two dorsal fins, each anteriorly with a strong spine; anal small, behind second dorsal.

Genus HETERODONTUS Blainville, 1816

The characters of the genus are sufficiently indicated in the family description. A single species is known from Peru.

HETERODONTUS QUOYI (Freminville)

Gato; Suño

Figure 4

Cestracion quoyi Fréminville, 1840, p. 2, pl., Galápagos Islands (original description).

Cestracion pantherinus Valenciennes, 1855, p. 350, pl. 10, fig. 2, Galápagos Islands (original description).

Gyropleurodus peruanus Evermann and Radcliffe, 1917, p. 2, pl. 1, fig. 1, Lobos de Tierra, Peru (original description).—Nichols and Murphy, 1922, p. 504, Lobos de Afuera Island, Peru.

Heterodontus peruanus Fowler, 1941a, p. 220, fig. 1 (references; range).

Heterodontus quoyi Beebe and Tee-Van, 1941, p. 117, fig. 30 (range; field characters; size; description; references; discussion in which conclusion is reached that *peruanus* is a synonym of *quoyi*).

Body robust anteriorly, its depth at origin of dorsal 4.2 to 5.9; head low, broad, heavy, its length to first gill slit 3.6 to 3.9 in length anterior to base of caudal; snout short, rounded, 1.75 to 1.9 in head to first gill slit; eye elongate, 6.4 to 7.6 in head, with a very heavy bony ridge above; spiracle small, below and slightly posterior to eye; mouth small, narrow, with thick labial lobes; teeth in anterior parts of jaws with a long rather pointed central cusp and a much smaller cusp on each side, the central cusps either broken or worn down in the lower jaw in a large female; dermal denticles below base of first dorsal more or less definitely +-shaped in two male specimens at hand, less definitely so, with one bar of the plus often forked, in a large female; first dorsal preceded by a very strong spine, about half as high as the fin, origin somewhat behind inner angle of base of pectoral, its height scarcely exceeding length of its base, its distal margin slightly convex; predorsal length 2.1 to 2.25 in length to base of caudal; distance between dorsal fins 4.1 to 4.3; second dorsal scarcely smaller than the first, and similar to it in all respects, ending about an eye's diameter in advance of origin of anal; caudal short, the upper lobe not greatly exserted, exceeding length of lower lobe by less than twice diameter of eye, its lower distal margin concave, its length 3.4 to 3.75 in length anterior to its base; anal fin shorter but higher than second dorsal, its base 3.75 to 4.25 in head; ventral inserted somewhat nearer pectoral than anal, its outer margin 1.7 to 1.85 in head; clasper in adult males about three times as long as that portion of fin next to it; pectoral very large and heavy, inserted under or somewhat in advance of third gill slit, 3.4 to 3.6 in length.

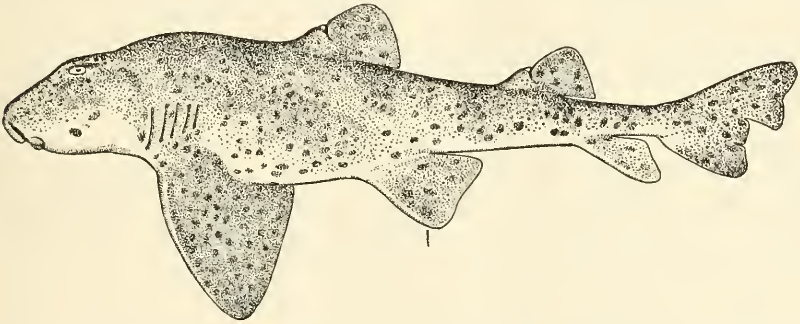

Figure 4.—*Heterodontus quoyi* (Freminville). From the type of *Gyropleurodus peruanus* Evermann and Radcliffe, 565 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77691). (After Evermann and Radcliffe, 1917.)

General color gray above ("dirty brown" in life), pale underneath; profusely spotted above and below with black spots variable in size, generally smaller than the eye; back with suggestions of dark bars in all three specimens at hand, agreeing in this respect with the type, *H. peruanus;* fins in general bearing the color of the body where attached, the pectorals and ventrals, however, becoming gray underneath distally; all fins spotted like the body.

The foregoing description is based on three specimens, two males each 415 mm. long and a gravid female 480 mm. long. The female contained eight more or less elongate eggs, seven in the right ovary and one in the left, the longest diameter varying from 33 to 52 mm.; all too immature to have developed a case. However, an egg case in excellent condition is at hand. This case is similar to that of *H. francisci,* as figured by Daniel (1934, p. 304), which agrees with three specimens of the same species examined by me in the U. S. National Museum. The Peruvian specimen, which tentatively at least may be identified as the egg of *H. quoyi,* like *H. francisci* has no tendrils. It is proportionately longer and has narrower spiral flanges, which also are more numerous. The case of *H. quoyi* is 105 mm. long; its greatest diameter without flanges is 40 mm.; the greatest width of the flanges does not exceed 10 mm. and seven spirals are present. An example of *H. francisci* has a length of 92 mm., and its greatest diameter is 41 mm.; the greatest width of the flanges is about 16 mm., and only five spirals are present. I follow Beebe and Tee-Van (see reference above) in considering the Peruvian and the Galápagos Islands representatives identical.

The gravid female in the collection was taken in a crab trap in Lobos de Tierra Bay on May 18. The two males were taken with hand lines at Lobos de Afuera Island. This little shark, which is not known to exceed a length of 565 mm., has already been recorded twice from Lobos de Tierra where it probably is common.

Range.—Galápagos Islands and northern Peru.

Family SCYLLIORHINIDAE: Cat Sharks

Body elongate; tail not keeled; no nictitating membrane; spiracles present; nostrils without grooves to mouth; mouth wide; teeth small to medium, several series functioning, with a median cusp and one to four small cusps on each side; gill openings five; two subequal spineless dorsal fins, the first over or behind ventrals; anal usually before second dorsal. A large family of small sharks found in all temperate and tropical seas, some of the species ranging into deep water.

Genus HALAELURUS Gill, 1861

Body rather short; tail long, slender; head short depressed; snout rather short; mouth broad, with labial folds; nostrils far apart, with two valves; gill slits narrow, the last two over pectoral; spiracle near lower posterior border of eye; origin of first dorsal behind insertion of ventral; second dorsal behind anal.

A Single species is known from Peru.

HALAELURUS CHILENSIS (Guichenot)

Peje-gato; Tollito

Scyllium chilensis Guichenot, *in* Gay, 1848, p. 362, Chile (original description)
Scyliorhinus chilensis Regan, 1908, p. 462 (synonymy; description).
Halaelurus chilensis Evermann and Radcliffe, 1917, p. 3, Mollendo, Peru (synonymy; description).—Fowler, 1941a, p. 220 (references).

Body slender, with a very long slender caudal peduncle, depth over middle of pectoral if laid back against body 7.6 to 7.8 in length to base of caudal; head low and broad, only about half as deep as wide over eyes, its length to first gill slit 5.6 in length anterior to base of caudal; snout somewhat pointed, 2.4 to 2.5 in head to first gill slit; eye elongate, superior in position, 6.6 to 7.0 in head; spiracle rather large, somewhat deeper than long, back of and somewhat below eye· mouth broad, much wider than interorbital space; labial folds on both jaws, of about equal length, the lower one extending about halfway to symphysis; teeth mostly tricuspid, the middle cusp long and narrow, the lateral ones very small; dermal denticles on anterior part of side more or less triangular, with a rather narrow base and a long sharp distal apex, and with suggestions of two or three ridges at base; first dorsal placed far back, its origin over or slightly behind middle of base of ventral, its height much greater than length of its base: predorsal length 1.95 to 2.05 in length anterior to base of caudal; distance between dorsal fins 4.65 to 5.1; second dorsal of about same size and shape as the first, its origin about over middle of anal base; caudal short, upper lobe 4.9 in length anterior to its base, with convex margin, lower lobe scarcely exserted, with base only a little shorter than head; anal smaller than dorsal fins, its base 2.0 in head; ventral inserted about equidistant from insertion of pectoral and origin of anal, its outer margin 1.75 to 1.9 in head, its distal margin slightly convex; pectoral somewhat larger than ventral, inserted under fourth gill slit, its distal margin broadly and gently convex, 1.35 in head.

Color of preserved specimens dark gray above; one specimen much darker than the other; pale underneath; with roundish dark spots above and below in the lighter specimen, not visible above in the darker one; the light specimen with nine indefinite broad bands on back, these not clearly evident in the dark one; fins of about the same color as that part of the body to which they are attached, spotted with black, the spots obscure in the dark specimen.

The collection contains two specimens, each 390 mm. long, which provide the basis for the foregoing description. The broad depressed head, the long slender peduncle, the superior eyes, and the very backward position of the first dorsal distinguish this shark from all others of the Peruvian fauna.

One of the specimens was taken with a trammel net in Independencia Bay, at Viejas Island, and the other with a line trawl on the north side of Atico Point. The largest specimen reported to date was only about 55 cm. (22 inches) long.

Range.—Southern Peru and Chile.

Family RHINCODONTIDAE: Whale Sharks

Body massive; tail with lateral keel; head and snout broad; eye small, lateral, without nictitating membrane; spiracle small; mouth very large, largely transverse; teeth small, numerous, subconic, curved; nasoral grooves present; no nasal cirri; gill slits wide, at least two above pectoral; two spineless dorsal fins, the first over ventrals; lower lobe of caudal large; anal small, opposite second dorsal; pectoral large.

Large sharks, pelagic in tropical seas.

Genus RHINCODON Smith, 1829

The characters of the single genus known are sufficiently indicated in the family description.

RHINCODON TYPUS Smith

Rhincodon typus SMITH, 1829, p. 443, Table Bay, South Africa (original description).—FOWLER, 1941a, p. 220 (references).

Rhinodon typicus GÜNTHER, 1884, p. 365, Callao, Peru (record based on a section of a dental plate).

Rhineodon typus GUDGER, 1935, p. 877 (reference to Günther's record; also to an account by William Nation in the *South Pacific Times*, January 24, 1878, published at Callao).—BEEBE and TEE-VAN, 1941, p. 97, fig. 3 (range; field characters; size; habits; references).

This large shark is readily recognized by the color. The head is spotted, and the body is covered with longitudinal and transverse pale bands, forming a checkerboard, with a pale yellowish spot in each quadrangle.

The references to its occurrence in Peru apparently are all based on a specimen from Callao. A length of at least 14 meters is attained.

Range.—Warmer parts of the Atlantic, Pacific, and Indian Oceans. Known from the Pacific coast of America from the Gulf of California to Peru.

Family SPHYRNIDAE: Hammerhead Sharks

Head greatly depressed and expanded, more or less hammer-shaped; eyes far apart, situated on the lateral margins of the expanded head; nostrils far apart, situated in or near the anterior margin of the head; spiracles absent; nictitating membrane present; the first dorsal large, situated in front of ventrals; second dorsal and anal small, placed opposite each other.

A single genus is usually recognized.

Genus SPHYRNA Rafinesque, 1810

The characters of the genus are sufficiently indicated in the family description.

KEY TO THE SPECIES[3]

a. Second dorsal with a long posterior lobe, about twice as high as anterior lobe; anterior margin of head with 3 lobes; a straight line connecting centers of eyes passing over the mouth ---------------------- **zygaena** (p. 27)

aa. Second dorsal with a short posterior lobe, about same height as anterior one; a straight line connecting center of eyes passing in front of mouth.

b. Anterior margin of head lobed, not forming a continuous curve.

c. Head broad, definitely hammer-shaped, its anterior margin more or less irregularly 4-lobed; teeth heavy, serrate -------------------- **tudes**

cc. Head narrower, not definitely hammer-shaped, but more or less kidney-shaped, its anterior margin irregularly oval; teeth slender, not serrate. **corona**

bb. Anterior margin of head not lobed, forming a continuous curve.

d. Anterior margin of head with a slight median angle; teeth with low cusps, which become progressively smaller toward angle of jaw, entirely absent on 1 or 2 rows in upper jaw, and on 4 or 5 rows in lower jaw; preoral length 1.5 to 1.75 in space between nostrils -------------- **vespertina**

dd. Anterior margin of head forming a broad continuous curve, without indication of a median angle; teeth all with cusps; preoral length 2.2 in space between nostrils ------------------------------------- **media**

SPHYRNA ZYGAENA (Linnaeus)

PEJE-MARTILLO; CRUZ; MEDIALUNA; CORNUDA; PEJE-CAPELO

Squalus zygaena LINNAEUS, 1758, p. 234, Europe, America (original description).
Zygaena peruana PHILIPPI, 1887, p. 545, pl. 2, fig. 2, Peru (original description).
Sphyrna peruana ABBOTT, 1899, p. 328 (reference to Philippi).
Sphyrna zygaena STARKS, 1906, p. 763, Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 5, Lobos de Tierra, Peru (references; measurements of a 100-cm. specimen).—NICHOLS and MURPHY, 1922, p. 504, Lobos de Tierra, Peru.—FOWLER, 1941a, p. 224 (references).—BEEBE and TEE-VAN, 1941, p. 114 (range; field characters; size; references).

Only the head of an individual, 154 cm. long, taken with a line trawl in about 18 fathoms near Cabo Blanco is at hand.

The species is recognized within its genus by the 3-lobed anterior margin of the head; the rather forward position of the eye, the diameter of which is greater than the lateral extension in front of it; a straight line connecting the middle of the eyes passes over the mouth; the lateral teeth have broad shoulders posteriorly, sometimes set off by a notch, and the margins of the teeth as well as the expanded shoulders are minutely serrate (becoming entire with age); and the produced posterior lobe of the second dorsal is about twice as high as the rest of the fin.

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[3] Although only one species, *zygaena*, has been definitely reported from Peru, a key, somewhat modified after Beebe and Tee-Van (1941, p. 114), to all the species known from the American side of the tropical Pacific is included as an aid in recognizing additional species, if taken in Peru.

The report of the Mission (p. 290) stated that many "hammer-head sharks" were seen, some as far south as Ilo and as far offshore as 50 miles. One was caught 20 miles northwest of Chinca North Island, and a "number" were taken on trawl lines near Cabo Blanco. The catch at Cabo Blanco includes the fish from which the head was removed, and six others, listed as varying in length from 1.05 to 1.38 cm. A length of 510 to 600 cm. is said to be attained.

According to the report of the Mission (p. 291) there may be more than one species, which may possibly be indicated by the several local names given at the head of this account. It is quite possible, of course, that *S. tudes*, which is widely distributed in tropical seas, though no definite American Pacific coast records south of the Gulf of California seem to exist, occurs along the coast of Peru. It is also entirely possible that one or all three species, *S. vespertina*, *S. media*, and *S. corona*, recently described by Springer (1940, pp. 161 to 169, figs. 1 to 7) may occur there. *S. vespertina* was reported from Panama City and Guayaquil, Ecuador; *S. media* from Mazatlán, Mexico, and Panama; and *S. corona* from Panama. A key to the species known from the tropical Pacific on the American side is offered above as an aid in recognizing additional species if taken in Peru.

According to the report of the Mission (p. 290) hammerhead sharks are "consumed fresh, dried or salted."

Range.—Tropical and temperate seas; recorded from the American side of the tropical Pacific from Mexico, Panama, Peru, and the Galápagos Islands.

Family GALEORHINIDAE: Gray Sharks

Body elongate; tail more or less compressed; head depressed; snout depressed, rounded to more or less pointed; eyes lateral, with nictitating membranes; mouth inferior, well arched; nostrils below snout; spiracles small or wanting; two spineless dorsal fins, the first entirely before ventrals, the second more or less opposite anal; caudal directed more or less upward; no keel.

A large family of sharks that has been divided into smaller families by some authors, but the regrouping does not seem satisfactory to the present writer.

KEY TO THE GENERA

a. Teeth in pavement, with more than one series functioning, with small cusps in some species; spiracles small; labial folds well developed__ **Mustelus** (p. 29)

aa. Teeth compressed, more or less triangular, a single series functioning; spiracles present or absent.

- *b.* Spiracles absent.
  - *c.* Labial folds wanting or rudimentary.
    - *d.* First dorsal placed posteriorly, the midpoint of its base being nearer insertion of ventrals than pectorals; teeth all with serrate margins. **Prionace** (p. 36)

dd. First dorsal placed more anteriorly, the midpoint of its base being nearer insertion of pectorals than ventrals; teeth of upper jaw at least serrate-- **Eulamia** (p. 37)

cc. Labial folds well developed, present on both jaws; teeth not serrate. **Scoliodon** (p. 40)

bb. Spiracles present.

e. Teeth large in both jaws, lateral ones curved backward, coarsely serrate along both margins; snout and mouth very broad; young at least with dark spots or bars---------------------------- **Galeocerdo** (p. 41)

ee. Teeth smaller, usually with median nonserrated cusps, more or less notched or serrate at base; snout and mouth rather narrow; color plain-- **Galeorhinus** (p. 42)

Genus MUSTELUS Link, 1790

Body moderately robust anteriorly, becoming very slender posteriorly; head and snout depressed; caudal peduncle slightly compressed; snout more or less produced, rounded; eye lateral, with a well-developed nictitating fold; spiracles small, an oval or elongate slit just behind eye; nostrils large, far apart; mouth crescent-shaped, with well-developed labial folds; teeth low, with broadly rounded margins or with low cusps; dorsal fins similar in shape, the first not far behind pectorals, the second smaller and in part over the still smaller anal; lower lobe of caudal long, without a prominent angle.

The teeth have often been described as being arranged like bricks in a pavement. That in general is true. However, the teeth individually have cutting edges, whether provided with cusps or not, and seem to be used for cutting, rather than for crushing.

KEY TO THE SPECIES

a. Teeth with nearly smooth rounded margins; young anteriorly with black cross bars above, posteriorly with black spots; adults with small white spots or flecks--**mento** (p. 29)

aa. Teeth anteriorly with a moderately prominent median cusp, lateral ones broader and occasionally with a slight notch; color plain gray at all ages---**dorsalis** (p. 32)

aaa. Teeth anteriorly with a single prominent cusp, most of lateral ones with a small cusp posterior to the large one, with a rather sharp notch between cusps; young with irregular black spots; adults plain gray. **maculatus** (p. 34)

MUSTELUS MENTO Cope

FIGURE 5

Mustelus mento COPE, 1877, p. 31, "Pacific Ocean at Pacasmayo, Peru" (original description).—FOWLER, 1908, p. 57, fig. 1 (redescription of type); 1940a, p. 173, figs. 10–13 (description; compared with *dorsalis* and *edulis*, both recognized as distinct); 1941a, p. 222 (references).—EVERMANN and RADCLIFFE, 1917, p. 6 (references).

Mustelus edulis PÉREZ CANTO, 1886, p. 1006, Valparaiso, Chile (original description).

Galeus dorsalis ABBOTT (not of Gill), 1899, p. 327, Callao, Peru.

Mustelus abbotti EVERMANN and RADCLIFFE, 1917, p. 6, pl. 1, fig. 2, La Ventanilla and Lobos de Tierra, Peru (original description).—NICHOLS and MURPHY, 1922, p. 504, Callao market, Peru.

Body moderately robust anteriorly, tapering posteriorly; its depth at origin of first dorsal 5.5 to 6.5 in length anterior to base of upper lobe of caudal; caudal peduncle very slender, its least depth 5.5 to 6.3 in head to first gill slit; head much depressed, its depth over middle of eyes about equal to width of mouth, its length to first gill slit 4.2 to 4.6 in length anterior to base of upper lobe of caudal; snout rather pointed, 2.1 to 2.3 in head, its preoral length only a little greater than width of mouth, 2.8 to 3.0 in head; eye quite elongate, 7.6 to 8.0; mouth rather narrow, its width at angles scarcely as great as space between outer margins of nostrils, 2.9 to 3.3 in head; labial folds present, the upper one longer and broader than the lower, the width of lower one not more than a third the distance to symphysis; teeth flat and smooth, without cusps; dermal dentacles with a moderately prominent median keel and generally with one and occasionally with two on each side (more prominent in specimens examined by me than shown by Bigelow and Schroeder, 1940, pl. 19, fig. C); first dorsal originating over or more usually somewhat behind midlength of pectoral, greatest height of fin (without thick base) generally about equal to width of head over eyes, the distal margin a little concave, with a slightly produced posterior lobe; predorsal length 2.6 to 3.0 in length anterior to base of upper lobe of caudal; distance between dorsals 4.6 to 5.1; second dorsal similar in shape though smaller than the first, its origin rather far behind vertical from distal margin of ventral; upper lobe of caudal moderately broad, with an oblique outer margin sometimes nearly as wide as interorbital space, entire length of lobe 4.2 to 4.7 in length anterior to its base, lower lobe distinct and long, with slightly concave outer margin, about as long as snout and eye; anal small, its origin about under middle of second dorsal, 3.0 to 3.5 in head; ventral inserted rather more than an eye's diameter

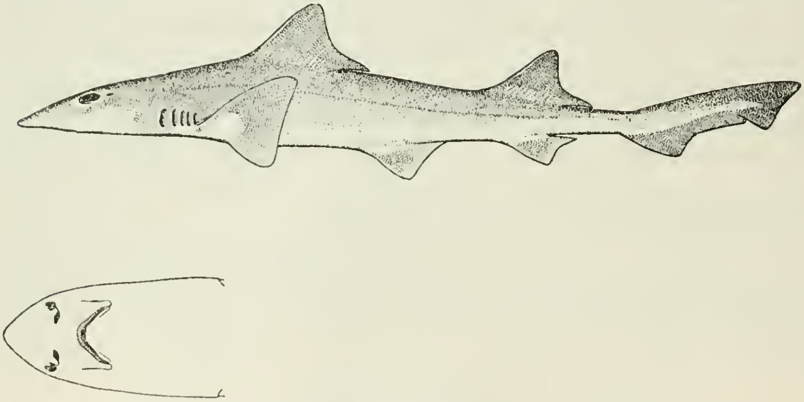

FIGURE 5.—*Mustelus mento* Cope. From the type of *M. abbotti* Evermann and Radcliffe, 550 mm. long, La Ventanilla, Peru (U.S.N.M. No. 77696). Insert, ventral view of head. (After Evermann and Radcliffe, 1917.)

behind base of first dorsal, with nearly straight distal margin, the outer margin 2.0 to 2.3 in head; pectoral large, with a slightly concave distal margin, inserted under or more usually somewhat behind third gill slit, its greatest length 5.4 to 6.0 in length anterior to base of upper lobe of caudal.

Color of adults in alcohol pale gray above, with specks or flecks of white, distinct in some specimens, obscure or wanting in others, probably always present in life; distal margins of dorsal fins dusky, more prominently so in some specimens than in others; distal margins of pectoral and ventral generally paler than rest of fins. Young with dark bars above (especially prominent in seven embryos, all from one female and all around 210 mm. long); first two forming a very narrow rectangle between the eyes; next pair also tending to meet at sides to form a broader rectangle at occiput; third pair forming a notably shorter quadrangle just in advance of first dorsal; five or six separate bars extending down to about middle of side under and posterior to first dorsal, and one or two dark spots on caudal peduncle. Some of the bars and the spots on the posterior part of the back have disappeared with age or faded in preservative, and the others are less distinct in a specimen 295 mm. long.

As no specimens between a length of 295 and 555 mm. are available, the length or size at which the bars disappear cannot now be stated. It is certain, however, that they are lost with age, as Mr. Lobell of the Mission stated in his field notes, "The adult did not have the black markings of the embryos, but rather several rows of white spots on the side on a brown ground."

The description is based principally on six specimens, 555 to 700 mm. long. The embryos, already mentioned, and a paratype of *M. abbotti*, 295 mm. long, differ in addition to the dissimilarity in color already described, in having a slenderer body, the depth at the origin of the first dorsal being contained 9.0 to 10.0 times in the length to base of upper lobe of caudal, and the eye is larger, 5.7 to 7.0 in head. In the embryos the teeth are virtually undeveloped. The type of *M. abbotti*, which now is 530 mm. long, agrees well with the larger specimens in the present collection, though the origin of the first dorsal and that of the anal are somewhat farther forward. It is evident from the specimens at hand, and from descriptions that considerable variation as to the position of the fins occurs.

It is virtually impossible to distinguish this species and *M. dorsalis* from the original description, which is inadequate. It is partly for that reason that Garman (1913, p. 178) considered it identical with *M. dorsalis* and that Evermann and Radcliffe (1917, p. 6), although recognizing *M. mento* as distinct from *M. dorsalis*, considered the specimens before them as undescribed, giving them the name *M. abbotti.* However, Bigelow and Schroeder (1940, p. 429) came to the conclusion that *M. abbotti* is a synonym of *M. mento*. Fowler (1908, p. 57), who redescribed the type of *M. mento*, did not follow Bigelow and Schroeder in his list of fishes of Peru (1941a, p. 222) wherein he recognized *M. mento*, but placed *M. abbotti* in the synonymy of *M. dorsalis*. Although I have not seen the type of *M. mento*, Fowler's description and figure (1908, p. 57, fig. 1) of the type make it possible to state definitely that *M. mento* is not identical with *M. dorsalis*, because the type of *M. mento*, which according to Cope is only 303 mm. long, still retains dark cross bars on the anterior part of the body, which *M. dorsalis* never possesses, as shown in the account of the last-mentioned species. Furthermore, the published accounts, as well as Fowler's figure give no character for separating *M. abbotti* and *M. mento*. The writer, therefore, has arrived at the conclusion with Bigelow and Schroeder (loc. cit.) that the two are identical.

The species is represented in the collection by six adult specimens, 555 to 700 mm. long, and by seven embryos, all removed from one female, and all around 210 mm. long. Five of the larger specimens, consisting of three males and two females, were taken with hook and line at San Lorenzo Island, near Callao, and one female, also caught with hook and line, on the south side of La Punta, Callao. The female from which the embryos were removed was taken on a line trawl in 9 to 10 fathoms off Lobos de Tierra Island on August 17. A length of at least 120 cm. is attained, as the female with embryos, already mentioned, had reached that length. Mr. Lobell of the Mission remarked in his field notes, "This species of shark is extensively used for food, both fresh and salted and dried in the sun." The dried product appears to be called *bacalao*.

Range.—Coast of Peru and apparently southward about to Concepción, Chile.

MUSTELUS DORSALIS Gill

Tollo

Figure 6

Mustelus dorsalis Gill, 1864, p. 149, Panama Bay (original description).—Evermann and Radcliffe, 1917, p. 7, pl. 1, fig. 3; pl. 2, fig. 1, Pacasmayo, and Lobos de Tierra, Peru.—Nichols and Murphy, 1922, p. 504, Callao market, Peru.—Fowler (part), 1941a, p. 222 (references).—Beebe and Tee-Van, 1941, p. 103, fig. 11 (range, field characters; size; references).

Depth at origin of first dorsal 7.2 to 8.3 in length anterior to base of upper lobe of caudal; head to first gill slit 4.5; length to origin of first dorsal 2.4 to 2.5; distance between dorsal fins 4.0 to 4.4; upper lobe of caudal 4.0 to 4.3; greatest length of pectoral 5.4 to 5.6. Snout 2.3 in head to first gill slit, its preoral length 2.9 to 3.0; width of mouth at angles 3.1; eye 6.8 to 6.9; caudal peduncle 7.2; base of anal 3.4; outer margin of ventral 2.4.

According to the specimens studied, *M. dorsalis* and *M. mento* differ constantly only in the structure of the teeth and in color. In *mento* the individual tooth has an almost smooth rounded margin, whereas in *dorsalis* it has a prominent sharp cusp. Although the teeth vary somewhat in shape according to the position in the mouth, the differences pointed out are readily recognizable in any of them. The teeth of these species, as well as those of *maculatus*, are well described and figured by Bigelow and Schroeder (1940, p. 428, pl.17). The dermal denticles as figured by these authors seem to be distinctive. However, a further study of these structures from specimens at hand reveals so much variation that I am now unable to point out an absolutely constant difference. In general, the denticle of *mento* has a prominent median keel, and usually one and sometimes two shorter and lower keels on each side of the median one. In *dorsalis* a median keel sometimes is present, with a shorter and lower keel on each side. More usually, however, two keels of about equal size occupy the middle of the denticle, just off the median line, and a very short low keel occurs on each side of the pair.

The color in *dorsalis* is plain gray above at all ages, as revealed by embryos and adults up to 510 mm. in length.

It has been thought and stated by some observers that *M. mento* (or *abbotti*) and *M. dorsalis* differ in the proportionate length and width of the snout, and in the position of some of the fins. However, so much variation exists among specimens that intergradation obviously occurs. This is especially true of Peruvian fishes. In specimens from Panama, the only other place from which examples are available, the snout actually is rather longer and narrower than in the Peruvian specimens. The material now available is inadequate, however, to show the significance.

In several embryos of each species at hand, and in specimens up to 390 mm. in length, the spiracle in *mento* is fully as long as the pupil, and only about half that long in *dorsalis*. In the larger specimens it is difficult, however, to demonstrate a difference.

The diagnostic characters of *dorsalis* and related species are discussed in part by Meek and Hildebrand (1923, pp. 32–35) and by Bigelow and Schroeder (1940, pp. 417–438). According to Beebe and Tee-Van (see reference above) a length of about 90 cm. is attained.

M. dorsalis is represented in the present collection by two specimens, 370 and 390 mm. long, taken on a line trawl in Sechura Bay. Ten embryos, each only about 60 mm. long, from Lobos de Tierra, collected by R. E. Coker, from two females, each about 80 cm. long, are also at hand. The proportions given in a preceding paragraph are based on the two larger specimens.

Range.—Gulf of California to or beyond Callao, Peru.

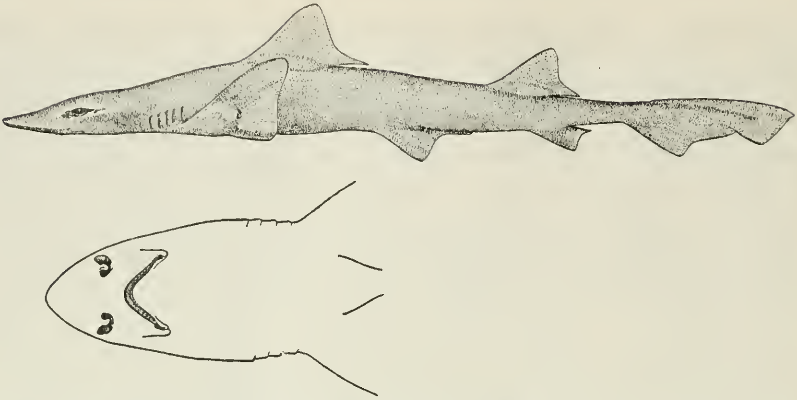

FIGURE 6.—*Mustelus dorsalis* Gill. From a specimen 500 mm. long from Pacasmayo, Peru (U.S.N.M. No. 77697). Insert, ventral view of head. (After Evermann and Radcliffe, 1917.)

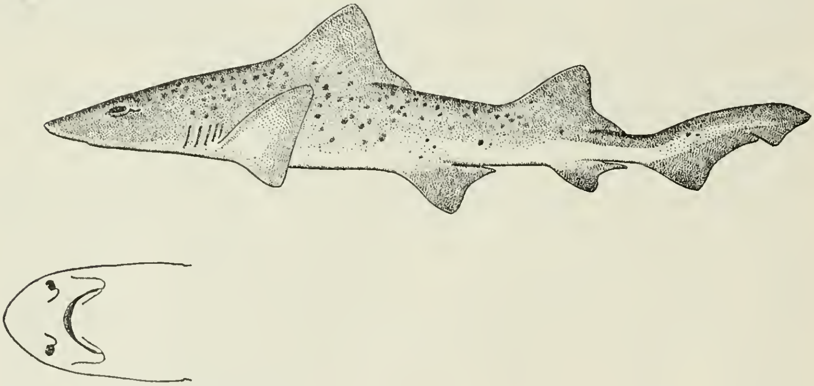

FIGURE 7.—*Mustelus maculatus* (Kner and Steindachner). From the type of *M. nigromaculatus* Evermann and Radcliffe, 510 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77699). Insert, ventral view of head. (After Evermann and Radcliffe, 1917.)

MUSTELUS MACULATUS (Kner and Steindachner)

CAZÓN; TOLLO; TOLLITO

FIGURE 7

Triakis maculatus KNER and STEINDACHNER, 1866, p. 391, listed from the indefinite locality "Sudsee" (original description).—STEINDACHNER, 1869b, p. 26, Mazatlán, Mexico.—GARMAN, 1913, p. 167 (redescribed from specimens from Callao, Peru).—BIGELOW and SCHROEDER, 1940, p. 428, pls. 17 and 19 (teeth and dermal denticles figured).—FOWLER, 1941a, p. 223 (references, range).—BEEBE and TEE-VAN, 1941, p. 101 (references, discussion).

Mustelus nigromaculatus EVERMANN and RADCLIFFE, 1917, p. 9, pl. 2, fig. 2, Lobos de Tierra, Peru (original description).

Body rather robust anteriorly, becoming very slender posteriorly; depth at origin of first dorsal 5.6 to 7.6 in length anterior to base of upper lobe of caudal; caudal peduncle about two-thirds as wide as deep, its depth 5.4 to 5.7 in head to first gill slit; head much broader than deep, its depth over middle of eyes equal to or a little greater than width of mouth, its length to first gill slit 3.9 to 4.1 in length anterior to base of upper lobe of caudal; snout somewhat pointed, 2.2 to 2.4 in head, its preoral length equal to or a little greater than width of mouth, 3.0 to 3.4 in head; eye elongate, 7.6 to 8.7; spiracle elongate, about as long as pupil; mouth much wider than long, its width a little less than distance between outer margins of nostrils, 2.8 to 3.2 in head; labial folds present, the upper one longer and broader than the lower, the latter reaching about halfway to symphysis; teeth anteriorly symmetrical, with one central cusp, those at sides asymmetrical with a small cusp posteriorly; dermal denticles variable, with rounded base and sharply pointed apex, occasionally with a notched margin, some with one or two low ridges if any at base, occasionally with a broad median ridge extending to apex; first dorsal originating about over beginning of distal third of upper margin of pectoral, greatest height of fin (without fleshy base) somewhat exceeding space between eyes, with slightly produced posterior lobe, its distal margin somewhat concave; predorsal length 2.25 to 2.45 in length anterior to base of upper lobe of caudal; distance between dorsal fins 3.7 to 4.2; second dorsal similar to first, though smaller, its origin well behind vertical from tip of distal margin of ventral; upper lobe of caudal with a nearly straight and oblique distal margin, entire length of lobe 3.5 to 3.9 in length of body anterior to its base; lower lobe separated by a notch, with long concave margin notably exceeding length of snout and eye; anal small, its origin about under middle of second dorsal, with rather strongly exserted posterior lobe, base of fin 3.0 to 3.4 in head; ventral inserted well behind base of first dorsal, with straight to somewhat concave distal margin, outer margin 1.9 to 2.3 in head; pectoral notably larger than ventral, generally with slightly concave distal margin, inserted a little behind third gill slit, its greatest length 5.0 to 6.2 in length anterior to base of upper lobe of caudal.

Color of small preserved specimens varying from pale gray to dark gray; back and sides with irregular black spots and specks, some individuals profusely spotted, others with comparatively few spots, one specimen with not more than a dozen specks on anterior part of body and more posteriorly; fins pale to dusky, black spots sometimes extending somewhat on bases of dorsal fins. The black spots, sometimes at least, seem to be lost with age, as Mr. Lobell of the Mission remarked in his field notes that 14 black-spotted embryos, of which 3 were preserved, were removed from a "plain dark gray female."

The description is based on the three embryos just mentioned, respectively 370, 390, and 396 mm. long, and six other specimens 372 to 490 mm. long. The type of *Mustelus nigromaculatus* Evermann and Radcliffe, now 480 mm. long, also is before me. The embryos agree well with the larger specimens, except that the teeth are not well developed. One specimen, which is shorter, though more robust, than the embryos, has the teeth fairly well developed.

This species is rather close to *M. mento* and *M. dorsalis* in shape and form but differs from both in the structure of the teeth, and the young at least also differ in color. Although this species has been considered generically distinct from *mento* and *dorsalis*, and also has been placed in a separate family, Triakidae (Beebe and Tee-Van, 1941, p. 94), on the basis of the structure of the teeth, it is not far removed in this respect from the last-named species. In my opinion the teeth in *dorsalis* differ more strongly from *mento* than from *maculatus*. Therefore, if *maculatus* is regarded as of distinctive generic rank, *dorsalis* and *mento* should also be so considered. However, it seems more expedient to assign them all to one genus in this publication.

The adult, from which the embryos at hand were removed, was 240 cm. long and was taken on a line trawl off Lobos de Tierra Island on August 17. One of the other specimens is from Lobos de Tierra Bay, and the other three were taken in trammel nets, at La Lagunilla, Patia Harbor, and at Don Martín Island.

Range.—Originally described from the indefinite locality "Südsee"; later recorded from Mazatlán, Mexico, and from Callao, Peru; and still later California and Chile were included in the range by Fowler (see reference above), but on what authority the extensions of range were based is not evident.

Genus PRIONACE Cantor, 1849

Body elongate, head tapering, depressed; snout rather long, pointed; eyes lateral, with well-developed nictitating membrane; spiracles absent; labial fold rudimentary; teeth more or less triangular, with serrate margins; first dorsal placed posteriorly, the midpoint of its base being nearer insertion of ventral than that of pectoral; second dorsal opposite the anal.

A single species is known from American waters.

PRIONACE GLAUCA (Linnaeus)

TINTORERA

Squalus glaucus LINNAEUS, 1758, p. 235, European ocean.

Prionace glauca JORDAN and EVERMANN, 1896, p. 33, pl. 4, fig. 16 (description; range; synonymy).

Galeus glaucus GARMAN, 1913, p. 145, pl. 3, figs. 1–3 (synonymy; description; range under generic account).

Glyphis glaucus FOWLER, 1941b, p. 178 (synonymy and references; description; range).

The Peruvian "tintorera" probably is this species, which is known as the "great blue shark" to many people who speak English. The tentative identification is based on a photograph in the report of the Mission (p. 291) and a short description of the color (p. 292). Although this species apparently is not recorded from Peru, it was been reported from Chile.

The distinguishing characters of *P. glauca* are: Color deep blue above, white underneath; head short; snout long, tapering; first dorsal large, nearer ventrals than pectorals; second dorsal and anal almost directly opposite each other, the latter with deeply concave margin; upper lobe of caudal equal to or longer than head; ventral small, not longer than anal; pectoral quite long, narrow, reaching nearly opposite posterior end of base of first dorsal; teeth strongly serrate, the lateral teeth of upper jaw with convex anterior and concave posterior margins.

This shark grows large, reaching a length of 4.6 to 6 meters, and is a very active fish. The following information is from the report of the Mission (1943, p. 292):

> On March 25 a trip was made from Mollendo to Ilo running a course about 20 miles offshore. The water temperature ranged from 20.3 to 24.5 degrees. Enormous numbers of blue sharks (*Prionace*) reaching an estimated length, in the largest ones, of at least five meters were seen on the surface. They were accompanied by large numbers of manta rays and yellow fin tuna. As far as can be determined, sharks of this type have never been reported unless they are the kind known to the Peruvian fishermen as "tintorera" (Coker reports that tintoreras have seablue backs and white undersides). The tintorera is regarded as highly dangerous since it kills without hunger and is as bloodthirsty as a tiger. An employee of the Compañía Administradora del Guano at La Puntilla said that the tintorera is the most dangerous shark in Peruvian waters and that they are known to attack small boats.

Range.—All tropical seas; on the Pacific coast of America from the Gulf of California to Chile. Fowler (see reference above) reported this species from Chile and has synonymized with it *Carcharias pugae* Perez Canto, *C. gracilis* Philippi, and *C. aethiops* Philippi, all from Chile.

Genus EULAMIA Gill, 1861

Body rather robust; head broad, depressed; snout produced; nostrils and mouth inferior; teeth compressed, more or less triangular, with a large cusp and usually a broad base; eyes small, with well-developed nictitating membrane; spiracles wanting; first dorsal not far behind pectoral; second dorsal small, wholly or partly above anal.

KEY TO THE SPECIES

a. Snout narrow, pointed, its preoral length about equal to width of mouth at angles; teeth narrowly triangular, especially in lower jaw, upper ones with serrate margins, lower ones nearly smooth; origin of second dorsal over or more or less behind that of anal; side of body with a slight dusky band extending back from above and behind pectoral, partly enclosing a pale area. **aetholorus** (p. 38) *aa.* Snout broadly rounded, its preoral length much less than width of mouth; teeth, especially in upper jaw, broadly triangular, all distinctly serrate; origin of second dorsal well in advance of that of anal; no dusky band on sides -- **azureus** (p. 39)

EULAMIA AETHOLORUS (Jordan and Gilbert)

CAZÓN; CAZÓN DE LECHE

Carcharias aetholorus JORDAN and GILBERT, 1882d, p. 104, Mazatlán, Mexico (original description).

Carcharinus limbatus NICHOLS and MURPHY (probably not of Müller and Henle; record based on jaws only), 1922, p. 504, Lobos de Tierra Island, Peru.

Eulamia limbata FOWLER (probably not of Müller and Henle), 1941b, p. 224 (references; range, given as including the Pacific, Atlantic, and Indian Oceans).

Eulamia aetholorus BEEBE and TEE-VAN, 1941, p. 106 (range; field characters; size; breeding; references).

Body moderately robust, its depth at origin of dorsal 3.4 to 3.6 in length anterior to base of upper lobe of caudal; caudal peduncle only moderately slender, its least depth 4.8 to 5.5 in head to first gill slit; head much depressed, its depth over eyes less than width of mouth by about half diameter of eye, its length to first gill slit 3.4 to 3.7 in length anterior to base of upper lobe of caudal; snout with rather narrowly rounded anterior margin, 2.4 to 2.5 in head, its preoral length about equal to width of mouth, 2.75 to 2.85 in head; eye nearly round, with a vertically elongate pupil, 9.25 to 9.8 in head; mouth moderately wide, distance between its angles exceeding internarial space by width of one nostril, 2.55 to 2.75 in head; labial folds represented by a short slit in upper lip very near angle of mouth; first dorsal originating somewhat behind midlength of pectoral, its greatest height about equal to width of head at eyes, its distal margin concave, with a very small, somewhat produced posterior lobe; predorsal length 2.1 to 2.25 in length anterior to base of upper lobe of caudal; distance between dorsal fins 3.1 to 3.3; second dorsal very small, produced and pointed posteriorly, its origin slightly in advance of middle of base of anal; upper lobe of caudal quite long, 2.75 to 3.0 in length anterior to its base; lower lobe exserted anteriorly, nearly as high as first dorsal; anal somewhat larger than second dorsal, its margin deeply concave, its base 5.0 to 6.0 in head; ventral moderate, inserted rather nearer tip of pectoral than origin of anal, its distal margin nearly straight; pectoral long, fairly pointed, with concave distal margin, inserted under fourth gill slit, its greatest length 4.3 to 4.7 in length anterior to base of upper lobe of caudal.

Color bluish gray above, pale below; side with a slight dusky band, extending backward from above and behind pectoral, partly enclosing a longitudinal pale area; vertical fins, exclusive of the anal, somewhat lighter gray than the back; pectoral quite dark above, pale underneath, the tip rather abruptly dark; anal and ventral only slightly dusky.

The foregoing description is based on 3 embryos in the collection, respectively 510, 533, and 550 mm. long, which with 20 others were removed from a female, the length of which was not stated in Mr. Lobell's field notes. The embryos are well developed in all respects, exclusive of the teeth and dermal denticles. In general the proportions are near those of adults, and the color agrees exactly. In addition to the embryos there are at hand the jaws, dorsal, anal, and pectoral fins of two adults, 295 cm. in total length ard 240 cm. to fork in tail, which I have identified with this species. The teeth have broad bases, with a rather long central cusp, narrower in the lower than in the upper ones. The cusps of the lateral teeth, especially in upper jaw, are directed somewhat backward. The teeth of the upper jaw are definitely serrate along both margins, whereas the lower ones are smooth or at the most only slightly serrate. The pectoral fins in each case are long and pointed and have the characteristic dark tips on the lower side.

The female from which the embryos in the collection were removed was caught on a line trawl, on March 26, at Coles Point. The local name given was "cazón de leche." The adults, of which parts were preserved, also were taken on line trawls, one at North Chincha Island and the other on the north side of Atico Point.

The specimens have been identified as *Eulamia aetholorus* where they may rest until the relationship of this group of sharks with long black-tipped pectorals is better understood. This course is taken notwithstanding the fact that Nichols and Murphy and Fowler (see citations above) considered the Peruvian representative as identical with *E. galeus* of the Atlantic and elsewhere. The embryos from Peru definitely have a proportionately broader and rounder snout than the young adults from Panama Bay and from Texas, with which they were compared. All the adults examined agree in the structure of the teeth.

Range.—Baja California to southern Peru.

EULAMIA AZUREUS (Gilbert and Starks)

Carcharias azureus GILBERT and STARKS, 1904, p. 11, pl. 2, fig. 5, Panama Bay (original description).—STARKS, 1906, pp. 762, 763, Guayaquil, Ecuador (compared with type; distribution).

Carcharias milberti MEEK and HILDEBRAND (in part *C. azureus* Gilbert and Starks), 1923, p. 38 (synonymy; description; specimen from New Jersey compared with one from Guayaquil, Ecuador).

Eulamia azureus BEEBE and TEE-VAN, 1941, p. 109, fig. 18 (range; field characters; size; references).

Although this species has not been reported from Peru, it may be expected there, as it has been taken at Guayaquil, Ecuador. A length of 282 cm. has been reported.

Characters for the recognition of this species are included in the key to the species.

Range.—Costa Rica to Ecuador. Apparently rather common in Panama Bay.

Genus SCOLIODON Müller and Henle, 1837

Body more or less compressed; head low, depressed; snout rather long, moderately pointed; mouth greatly arched; lips with short folds; teeth with broad bases with a rather high narrow cusp, the lateral ones usually with an additional small posterior cusp, edges not serrate; nictitating membrane present; subcaudal lobe large.

This genus is now for the first time reported from Peru.

SCOLIODON LONGURIO (Jordan and Gilbert)

TOLLO; TOLLITO

Carcharias longurio JORDAN and GILBERT, 1882d, p. 106, Mazatlán, Mexico (original description).

Scoliodon longurio JORDAN and EVERMANN, 1896, p. 42 (description).—GILBERT and STARKS, 1904, p. 12, Panama Bay.—GARMAN, 1913, p. 114 (description; range).—MEEK and HILDEBRAND, 1923, p. 52, pl. 2, fig. 1, Panama Bay (description).—TORTONESE, 1939b, p. 198, pl. 5, fig. 1, Callao, Peru (Synonymy; description).—BEEBE and TEE-VAN, 1941, p. 112, fig. 22, (range; field characters; color; size; references).

Body slender, its depth at origin of first dorsal 6.0 to 6.4 in length anterior to base of upper lobe of caudal; caudal peduncle only moderately slender, its least depth 5.1 to 5.5 in head to first gill slit; head much depressed, rather narrow, its depth over eyes less than width of mouth by about half diameter of eye, its length to first gill slit 3.5 to 3.75 in length anterior to base of upper lobe of caudal; snout quite long, rather pointed, 2.3 in head, its preoral length exceeding width of mouth by fully half diameter of eye, 2.5 in head; eye nearly round, with vertically elongate pupil, 10.5 in head; mouth rather narrow, its width at angles about equal to space between outer margins of nostrils, 2.8 to 2.9 in head; labial folds well developed, the upper one longer and broader than the lower, about a third the length of the jaw to midline of snout; teeth anteriorly quite erect, directed somewhat backward laterally, with a rather long narrow cusp, and laterally with a low auxiliary cusp behind, sometimes appearing merely as a broadened base, margins of teeth not serrate; dermal denticles short and broad, with three prominent parallel ridges, each extending beyond outer margin of denticle; first dorsal originating over beginning of distal third of pectoral, its greatest height generally somewhat exceeding width of head at eyes, its distal margin concave, with a narrow produced posterior lobe; predorsal length 2.1 to 2.2 in length anterior to base of upper lobe of caudal; distance between dorsal fins 2.9 to 3.1; second dorsal very small, posteriorly produced, pointed, length of produced lobe about 1.5 times length of base of fin, origin of fin about over middle of base of anal; upper lobe of caudal rather long, 3.15 to 3.6 in length anterior to its base; lower lobe separated by a notch, exserted anteriorly; anal similar to second dorsal, though somewhat longer, its base 4.6

to 4.75 in head; ventral rather small, inserted about an eye's diameter nearer origin of anal than inner distal angle of pectoral, its distal margin very slightly concave, the outer margin 4.15 to 4.25 in head; pectoral moderate, with slightly concave distal margin, inserted under fourth gill slit, its greatest length 5.45 to 5.65 in length anterior to base of upper lobe of caudal.

Color bluish gray above; rather abruptly pale at or somewhat below middle of side; margin of caudal, exclusive of exserted portion of lower lobe, with a narrow black margin.

The foregoing description is based on two specimens, a male 670 mm. and a female 665 mm. long. The claspers in the male are rather more than three times the length of the ventral fin. In addition to the specimens mentioned the collection contains five embryos, 277 to 300 mm. long, removed from a female 154 cm. long. These agree fairly well with the adults, except that the teeth are virtually undeveloped. The following proportions are based on two of the embryos mentioned: Depth at first dorsal in length anterior to base of upper lobe of caudal 6.0 to 6.35; head to first gill slit 3.3 to 3.4; predorsal length 2.1 to 2.2; distance between dorsal fins 3.15 to 3.25; upper lobe of caudal 2.8 to 2.9; pectoral 6.0 to 6.35. Caudal peduncle in head to first gill slit 5.25 to 5.4; snout 2.25 to 2.4; preoral length of snout 2.3 to 2.4; eye 8.3 to 8.75; width of mouth 2.95 to 3.15; anal base 5.25 to 5.6; outer margin of ventral 4.2 to 4.8.

The two adult specimens in the collection, according to Mr. Lobell's field notes, were taken on August 15 on a line trawl with 15 others, 14 of which ranged from 720 to 970 mm. in length, and one was 1,540 mm. long, in the Gulf of Guayaquil near Cabo Blanco. The embryos mentioned in the preceding paragraph were removed from a female 154 cm. long taken on the same date, at the same place, and by the same method, in 12 fathoms. A specimen from Panama, 580 mm. long, is at hand for comparison.

Range.—Gulf of California to northern Peru.

Genus GALEOCERDO Müller and Henle, 1837

Body robust; snout short, broad; mouth wide; teeth similar in both jaws, large, the lateral ones curved backward, coarsely serrate on both margins; labial folds present; nictitating membrane present; spiracles small, behind eyes; first dorsal nearer pectorals than ventrals; second dorsal and anal opposite each other; upper lobe of caudal long.

GALEOCERDO ARTICUS (Faber)

TIGER SHARK; LEOPARD SHARK

Squalus articus FABER, 1829, p. 17, Iceland and neighboring seas (original description).

Galeocerdo maculatus JORDAN and BOLLMAN, 1890, p. 179, Panama Bay.

Galeocerdo tigrinus SNODGRASS and HELLER, 1905, p. 342, Albemarle and Narborough Islands, Galápagos.

Galeocerdo articus Meek and Hildebrand, 1923, p. 56, Panama Bay (synonymy; description; range).—Beebe and Tee-Van, 1941, p. 113, fig. 23 (range; field characters; size; references).

This large shark, though not recorded from Peru, may be expected there. In fact it has been seen and taken several times in the Galápagos Islands. It is recognized by its heavy body, broad snout, very wide mouth, large caudal fin with a long upper lobe and a keel at the base, and usually by the presence of black spots or bars, which, however, may be lost with age. The teeth in the jaws are strong, curved backward, with a notch posteriorly, followed by coarse serrae; the main cusp also with serrate margins.

The tiger shark, which attains a length of perhaps 6 meters or more, is considered among the most dangerous to man.

Range.—Tropical seas. Recorded on the Pacific coast of America from San Diego, Calif., to the Galápagos Islands.

Genus GALEORHINUS Blainville, 1816

Body moderately slender; head depressed; snout rather narrow; eye elongate, with nictitating membrane; mouth moderately wide, with rather well developed labial folds; teeth subtriangular, lateral ones inclined backward, more or less notched or serrate at base posteriorly; spiracle small, rather close behind eye; first dorsal over space between pectorals and ventrals; second dorsal and anal more or less directly opposite each other.

A single species is included in the collection.

GALEORHINUS ZYOPTERUS Jordan and Gilbert

Tollo

Galeorhinus zyopterus Jordan and Gilbert, 1883a, p. 871, San Francisco, Calif., to Cerros Island, Baja California (original description; previously identified with *G. galeus*).—Jordan and Evermann, 1896, p. 32; 1900, pl. 4, fig. 15 (description; range).

Galeus zyopterus Evermann and Radcliffe, 1917, p. 10, Pacasmayo, Peru (description based on 3 small specimens).

Galeorhinus galeus Fowler (probably not of Linnaeus), 1941a, p. 223 (references).

Body moderately slender, its depth at origin of first dorsal 7.0 to 7.5 in length anterior to base of upper lobe of caudal; caudal peduncle rather slender, its least depth 5.4 to 5.75 in head to first gill slit; head much depressed, its depth over eyes notably less than width of mouth, its length to first gill slit 3.4 to 3.8 in length anterior to base of upper lobe of caudal; snout moderately long and pointed, 2.4 to 2.8 in head, its preoral length about equal to width of mouth, 2.5 to 2.8 in head; eye somewhat elongate, 5.0 to 5.9; pupil nearly or quite round; a definite notch behind eye; spiracle small, oval or an elongate slit rather close behind eye; mouth moderately wide, about as broad as head at nostrils, 2.4 to 2.8 in head; labial folds well developed, the upper one the larger, reaching about a third the distance to midline of jaw; teeth with a rather long narrow nonserrated cusp with an almost straight anterior margin, posteriorly with a small notch followed by a small cusp and sometimes by serrae on an expanded base, the middle ones especially those of lower jaw reduced; dermal denticles narrow, sharply pointed distally, usually with a large median keel and a small one paralleling it on each side, all extending beyond the margin, causing deep indentations; first dorsal originating about over beginning of distal third of pectoral, its greatest height about equal to interorbital space, its distal margin concave; predorsal length 2.2 to 2.4 in length anterior to upper lobe of caudal; distance between dorsal fins 3.2 to 3.8; second dorsal small, its origin a little in advance of that of anal; upper lobe of caudal moderately long, 3.0 to 3.2 in length anterior to its base; lower lobe exserted anteriorly, nearly as high as first dorsal; anal nearly of same size and shape as second dorsal, its base 4.5 to 5.8 in head; ventral short, inserted about equidistant from inner distal angle of pectoral and origin of anal, its distal margin nearly straight; pectoral moderate, somewhat rounded distally, inserted under fourth gill slit, its greatest length 5.6 to 6.2 in length anterior to base of upper lobe of caudal.

Color of preserved specimens bluish gray above; pale underneath. The first dorsal in embryos conspicuously white at base anteriorly and distally posteriorly, the distal margin of dark part of fin with black margin; the posterior part of second dorsal distally also conspicuously white, lower lobe of caudal at its deepest concavity, and the tip of upper lobe conspicuously black; pectoral fin with pale margin. These markings, though persisting, are less conspicuous in small adults, 363 and 384 mm. long.

The foregoing account is based on nine embryos, 225 to 240 mm. long, and two young adults, 363 and 384 mm. long. In addition to these young there are at hand a head of an individual 152 cm. long and the jaws and part of the fins of another large adult (length unknown). The teeth in these large specimens are much more conspicuously serrate on the base posteriorly than in the young, the first serra often being only a little larger than the succeeding one; anterior part of expanded base also often with two to several serrae. The pectoral fins are more pointed, and there remains a mere suggestion of a pale margin, the other pale markings of the young having entirely disappeared. The first dorsal and the pectoral (the only fins preserved) are distally profusely dotted and spotted with black. The following proportions are based on measurements made by Mr. Lobell of four fresh individuals, all females with embryos, 152 to 158 cm. long: Head 4.0 to 4.25 in length anterior to base of uppper lobe of caudal; predorsal length 2.15 to 2.35; distance between dorsal fins 3.1 to 3.3; upper lobe of caudal 3.5 to 3.9; pectoral 4.8 to 5.0. Snout 2.3 to 2.7 in head to first gill slit; eye 8.3 to 9.7; base of anal 4.5 to 5.2. These proportions show that large individuals have proportionately shorter heads and smaller eyes, as expected; that the upper lobe of the caudal is shorter; and that the pectorals become more pointed with age, and also increase in proportionate length.

It is not evident now from the meager material available for study wherein the Peruvian specimens differ from California examples, which include the small eviscerated "types" (U.S.N.M. No. 26973). Therefore, the Peruvian specimens are here placed with *G. zyopterus*, the common and valuable soupfin shark of the Pacific coast of the United States, where they may remain at least until a more thorough study of the Pacific coast residents in comparison with the apparently closely related Atlantic (European) form, *G. galeus* (Linnaeus), can be made.

The nine embryos in the collection were removed from a female 148 cm. long, taken at Lobos de Afuera Island on July 19. The one from which the head, now at hand, was removed apparently was one of the four females, 152 to 158 cm. long, for which some proportions are given above, which were caught at the same place on July 20. The male, of which the jaws and some of the fins were saved, was taken at Atico Point. The specimens appear to have all been caught with line trawls. In addition to the specimens already mentioned, two small specimens 363 and 384 mm. long (U.S.N.M. Nos. 77542 and 77641), taken at Pacasmayo, also were used in preparing the description. This shark probably is common in Peru.

Range.—Washington State to southern Peru, and possibly to Chile if *Galeus chilensis* Perez Canto and *Galeus molinae* Philippi should prove to be the same. There are as yet no records of the capture of specimens between Baja California and Peru. The absence of specimens in collections from intermediate localities suggests the probability that a comparison of a good series of examples from the two regions where this shark is common might reveal some differences.

Family CETORHINIDAE: Basking Sharks

Body massive anteriorly, tapering rather abruptly behind first dorsal fin; head and snout somewhat conical; eye small, lateral, without nictitating membrane; spiracle small, in front of eye; mouth large; teeth very small, numerous, conic; gill slits very long, extending from dorsal surface nearly to midline of throat, all in front of pectoral; first dorsal large, about equidistant from pectorals and ventrals; second dorsal and anal small, opposite each other; caudal lunate, upper lobe the longer, with keels near its base; pectoral large.

A single genus and species has been recognized. Large pelagic sharks.

Genus CETORHINUS Blainville, 1816

The characters of the genus are sufficiently indicated in the family description.

The basking shark rivals the whale shark in size, and like the whale shark it is a sluggish creature, harmless to man, feeding on small and minute forms of life strained from the water by peculiarly constructed gill rakers. Its common English name is appropriate because it is often seen "lying" quietly at the surface.

CETORHINUS MAXIMUS (Gunner)

Basking Shark

Squalus maximus Gunner, 1765, p. 33, pl. 5, coast of Norway (original description).

Cetorhinus maximus Garman, 1913, p. 39 (synonymy; description; range).—Gudger, 1915, p. 653 (reference to Stevenson (1902, p. 227), who reported the basking or bone shark as numerous on the coast of Peru and Ecuador).—Beebe and Tee-Van, 1941, p. 98, fig. 4 (range; field characters; size; references; discussion).

Halsydrus maximus Fowler, 1941b, p. 113 (synonymy; description; range); 1941a, p. 222 (references; range).

The basking shark may be recognized by its massive body; rather conical snout; very long gill slits, beginning at dorsal surface and extending nearly to midline of throat; first dorsal much larger than the second, about equidistant from pectorals and ventrals; second dorsal and anal very small, opposite each other; caudal lunate, with keels near base; plain gray color; and by the large size (7 meters or so) attained.

The occurrence of this shark in Peru, so far as the writer is aware, has been reported only by Stevenson (see reference to Gudger above), who said, "The basking shark is numerous on the coast of Peru and Ecuador, and its capture gives employment to a large number of small vessels, manned by 6 or 8 men each. The American vessels fishing for humpback whales on that coast have occasionally engaged in its capture when whales were not in sight. Capt. George O. Baker, of New Bedford, reports that on one occasion in two days fishing he secured 125 barrels of shark oil while on the lookout for humpback whales." Presumably the report of Captain Baker was verbal, as no reference is cited. It may be assumed that the fishery for basking shark by small vessels is no longer carried on, or the Mission would have reported it. In fact, there seems to be nothing in the report of the Mission indicating that any fish as large as the basking shark were seen.

Range.—Arctic and Antarctic and the temperate seas. On the Pacific coast of America it has not yet been reported from the area between southern California and Ecuador, except for a doubtful observation near Cape San Lucas. Norman (1937, p. 7) properly has questioned the identity of the repesentatives of the basking sharks of the Northern and Southern Hemispheres.

Family ISURIDAE (?): Mackerel Sharks

[After the manuscript on the Peruvian collections was completed, my attention was called to two views of a shark appearing on the front cover of the Andean Air Mail and Peruvian Times, volume 4, No. 192, August 28, 1944. The shark was reported to have been caught in "a fishing net outside of Ancon Bay." It had a length of 5 meters (about 16.6 feet) and a weight of 1,200 kilos (2,640 pounds). One view shows the back and most of one side, and the other the ventral surface of the head. Although I cannot be certain of the identification, such characters as are discernible suggest that it was a maneater or white shark, *Carcharodon carcharias* (Linnaeus), assigned to the family Isuridae by recent writers. While this shark has not been reported from Peru, it was to be expected there, as it is distributed throughout nearly all tropical and temperate seas. The maneater is characterized by its massive body, conical snout, depressed caudal peduncle, and the broadly triangular teeth, which have serrated margins.]

Family SQUATINIDAE: Angel Sharks

Body and tail depressed; snout obtuse; gill slits wide, partly inferior, and partly hidden under anterior free part of pectoral; spiracles wide, placed well behind eyes; nostrils on front rim of snout, with membranous flaps; mouth only slightly inferior, broad, bent forward; teeth moderately small, sharp, far apart; tail bearing two subequal dorsal fins; no anal fin; ventral very large; pectoral broad, not attached to head, with a free lobe anteriorly.

Peculiar small sharks; intermediate in structure and appearance of sharks and skates.

Genus SQUATINA Duméril, 1806

The characters of the genus are sufficiently indicated in the family description. The species of this genus are widely distributed, principally in temperate waters.

SQUATINA ARMATA (Philippi)

ANGELOTE

Rhina armata PHILIPPI, 1887, p. 561, pl. 7, fig. 1, Iquique, Chile (original description).

Squatina squatina EVERMANN and RADCLIFFE, 1917, p. 11, Lobos de Tierra, Peru (description).

?*Squatina armata* NORMAN, 1937, p. 10, Argentina (description; compared with *S. aculeata* (Cuvier) and *S. japonica* Bleeker).—FOWLER, 1941a, p. 224 (references).

Body with pectorals forming an imperfect disk, its anterior outline rather strongly convex; its greatest width at outer angles of pectorals, about 1.9 in total length; its length from anterior margin of snout to posterior margin of pectoral 2.25; length anterior to axil of pectoral

3.25; length anterior to vent 2.35; length posterior to vent 1.9; tail strongly depressed, its width at axil of ventral 2.8 in length anterior to axil of pectoral; its depth at same place 5.1; depth of peduncle 12.7; tail coming to a narrow edge laterally, though not keeled; snout very short and broad, its length anterior to eye about 7.75 in length anterior to vent, and notably less than interorbital space, the latter 3.5 in length anterior to axil of pectoral; eye very small, 6.3 in interorbital space; spiracle rather far behind eye, not quite twice as broad as eye, 3.65 in interorbital space; space between spiracles narrower than that between eyes, 3.75 in length anterior to axil of pectoral; mouth broad, bent forward, not quite terminal, its width 2.4 in length anterior to axil of pectoral; teeth rather broad at base, with a sharply pointed cusp, in 18 widely separated longitudinal series in each upper jaw, no median series in either jaw; nostrils on rim of snout, space between them notably less than interorbital space, 1.35 in interorbital, and 4.65 in length anterior to axil of pectoral; outer lobe of nostril narrow, notched on one nostril, but entire and convex on the other; inner lobe broad, its inner parts scalloped, with a small rather long, narrow paddle-shaped auxiliary lobe originating above its inner angle; skin above everywhere rough, with 1- to 3-keeled pointed denticles over shoulders; a median series of enlarged denticles (or tubercles), beginning over ventrals and continued to second dorsal; a similarly enlarged patch of denticles in front and behind eye, four above upper margin of snout and another small group between spiracles; denticles continued on all the fins and also on nearly the entire lower surface of pectorals and ventrals, a transverse band on the chest, a larger patch on the abdomen, and on entire under surface of tail, except at base; dorsal fins of nearly equal size and shape, the base of the second about half interorbital space, its height about equal to interorbital space; space between dorsals equal to distance from second dorsal to beginning of upper lobe of caudal; caudal broadly concave, the lower lobe longer than the upper; ventral broad with an acute inner lobe, its distal margin nearly straight, its outer margin 2.55 in length anterior to axil of pectoral; pectoral broad, with a free anterior angle, posteriorly partly overlapping ventral, its outer and distal margins forming a right angle, the latter scarcely concave, its outer margin 3.5 in total length.

Color now virtually uniformly gray above, pale underneath. Color described by Evermann and Radcliffe (see citation above), when the specimen had not been in preservative a very long time, as "ashy gray, finely mottled and blotched with olive; dusky areas on dorsal and caudal, larger and irregular in form; ventral surface white."

The foregoing description is based on a specimen (U.S.N.M. No. 77708) 585 mm. long, according to my measurement (not 560 mm. as stated by Evermann and Radcliffe), taken at Lobos de Tierra, Peru, by R. E. Coker. The specimen apparently is an immature male, as the claspers are small and soft, notably shorter than adjacent parts of ventrals.

The relationship of the several species of *Squatina* that have been recognized is not well understood. I am not at all certain that the specimen at hand is identical with *S. armata* (Philippi). I do believe it to be specifically distinct from the specimens from Argentina identified as *S. armata* by Norman (see citation above), as the Peruvian specimen does not agree with Norman's description of the last-mentioned specimens in several respects. In the Peruvian specimen the space between the spiracles is narrower than the interorbital space, whereas it is equal to interorbital space in the Argentine specimens; the eye apparently is smaller, being contained in the interorbital space 6.3 times in the Peruvian fish and only 4.5 in the Argentine ones; the caudal fin seems to be more deeply lunate, with the lower lobe more acutely pointed in the Peruvian specimen, which also seems to be rougher underneath, having denticles over a greater part of the ventral surface, on the chest and abdomen (which are described as naked in Argentine specimens) and on virtually the entire under surface of the pectorals and ventrals. All the differences mentioned have been verified from a specimen 510 mm. long (U.S.N.M. No. 53440) from Argentina.

S. californica, the north Pacific representative of the genus on the American coast, differs from the Peruvian specimen, as shown by comparing a female 390 mm. long, taken off northern California in having a much narrower nasal lobe on inner side of the nostril, which is not scalloped on its inner base; the internarial space is broader, exceeding the interorbital space; the eye is larger, its longitudinal diameter being nearly equal to the transverse diameter of the spiracle, and is contained only 4.8 times in interorbital space; the distal margin of the pectoral is definitely more concave, and its posterior angle is more sharply rounded; the denticles on the dorsal surface are notably larger and coarser; and on the ventral surface they are present in a band only along the margins of the pectorals and ventrals, and on the tail, there being none on the bases of the fins and none on chest or abdomen.

Range.—Probably Peru and Chile.

Family TORPEDINIDAE: Electric Rays

Head, trunk, and pectorals forming a subcircular disk; tail short, rather stout, bearing one or two dorsal fins and a caudal fin; with or without lateral dermal folds; electric organs present, situated in shoulder region; eyes and spiracles close together, superior; nasal valves confluent; skin naked, soft and smooth.

A single genus seems to be represented in the Peruvian fauna.

Genus DISCOPYGE Tschudi, 1846

Disk more or less circular, about half the total length; electric organs present; a cartilaginous support extending forward from interorbital ridge; mouth small; teeth in pavement; spiracles close behind eyes; skin smooth; tail depressed, with lateral folds, and two dorsal fins of about equal size, and a rather broad caudal fin; ventral fins united by membrane across the tail, or at least attached to the tail, wherein this genus differs chiefly from *Narcine*.

A single species is recorded from Peru.

DISCOPYGE TSCHUDII Heckel

Discopyge tschudii Heckel, *in* Tschudi, 1845, p. 33, pl. 6, Heradura, between Huacho and Chancay, Peru (original description).—Abbott, 1899, p. 329 (original description republished).—Norman, 1937, p. 11, fig. 3, 46°18′15″ S., 65°02′15″ W., Buenos Aires, Argentina, and Coronel, Chile.—Fowler, 1941a, p. 225 (references).

Disk very nearly as wide long, its anterior outline broadly rounded; its width 2.0 in total length; its length 1.95; its length anterior to axil of pectoral 2.1; length anterior to vent 2.0; length posterior to vent 2.05; tail moderately depressed, its width at axil of ventrals 6.2 in length anterior to vent; its depth at same place 12.0; depth of its peduncle 4.3 in snout; with a very prominent lateral dermal fold, beginning about under origin of first dorsal; snout fairly long, its length anterior to eye 4.0 in length anterior to vent; its preoral length 3.7; rostral cartilaginous supports extending forward from interorbital ridges slightly divergent; eye very small, notably smaller than spiracle, the former 6.85 in snout anterior to eye; interspiracular space broad, 1.6; mouth small, its width 3.7 in snout anterior to eye; teeth transversely elongate, each tooth with a point posteriorly, rather larger and sharper on the posterior teeth than the anterior ones; the two dorsal fins nearly of same shape and size, the base of the second one 2.1 in snout, and its height 1.9; space between dorsal fins 4.3; caudal fin rather broad, with obliquely rounded margin, the upper part being longer than the lower; ventral with a very broad, gently convex distal margin, its outer margin 4.0 in length anterior to vent; claspers about a fourth longer than adjacent parts of ventrals, 4.5 in length anterior to vent.

Color above brown; the numerous pores appearing as pale specks; plain pale underneath.

The foregoing description is based on a male, 390 mm. long, from "Argentina," which seems to agree well with the original description. Only the specimen on which the original description was based is known from Peru.

Range.—Southward from about the middle of Peru, and apparently on the Atlantic to the Río de la Plata.

Family RHINOBATIDAE: Guitarfishes

Body depressed throughout; anterior part of body with pectorals forming a disk, tapering forward; tail rather wide at base, with a lateral dermal fold; spiracle large, immediately behind eye; nostril oblique, wide; teeth in pavement; dorsal fins 2, both on the tail.

A single genus is represented in the Peruvian collection.

Genus RHINOBATOS Link, 1790

Disk subtriangular, wide posteriorly, tapering forward into the rather pointed snout; snout formed by a long rostral cartilage and a large more or less translucent area on each side; the large spiracle usually with two dermal folds, rarely with one or none, on its posterior surface; first dorsal behind ventrals; no subcaudal lobe; ventrals close to pectorals.

A single species is known from Peru.

RHINOBATOS PLANICEPS Garman

GUITARRA

FIGURE 8

Rhinobatus planiceps GARMAN, 1880, p. 168, Peru and Galápagos Islands (original description); 1881, p. 520, Paita and Callao, Peru; Galápagos Islands (description); 1913, p. 283, pl. 17a, figs. 3–4 (description).—EVERMANN and RADCLIFFE, 1917, p. 12, pl. 2, fig. 3, Lobos de Tierra, Peru (description).—NICHOLS and MURPHY, 1922, p. 504, Pacasmayo, Peru.—FOWLER, 1941a, p. 225 (references; range).—BEEBE and TEE-VAN, 1941, p. 251, fig. 6 (range; field characters; size; references).

Body depressed throughout; disk moderately broad, its width at broadest point 1.05 to 1.2 in length anterior to axil of pectoral, or 2.75 to 3.1 in total length; length anterior to vent 2.3 to 2.45 in total length; width of tail at axil of ventrals 3.2 to 4.5 in length anterior to axil of pectoral, with a prominent lateral dermal fold; snout long, moderately narrow, its lateral margins very slightly concave, its length anterior to eyes 2.6 to 2.9 in length anterior to axil of pectoral, its preoral length 2.2 to 2.6; rostral cartilage narrowest at midlength, the ridges close together and parallel for fully half its length; longitudinal diameter of eye slightly exceeding greatest diameter of spiracle, 3.8 to 5.4 in snout; interorbital 2.6 to 3.1; spiracle about as large as eye, with a rudimentary fold on its posterior margin; nostril oblique, larger than internarial space; mouth arched forward slightly in middle; its width 1.95 to 2.2 in snout; teeth in jaws flat, in pavement; median line of back at least to second dorsal with low keeled bucklers, these also present on tip of snout, over superior orbital rim and at shoulders, and on ridges of rostral cartilage in some specimens, apparently more prominent in the young than in adults; dorsal fins of approximately the same size and shape, highest anteriorly, distal margins nearly straight, origin of the first about equidistant from vertical from vent and origin of second dorsal; caudal scarcely rounded at tip, no distinct lower lobe, ventral margin broadly convex; ventral inserted close behind axil of pectoral, with gently convex distal margin; pectorals posteriorly broadly rounded.

Color rather light gray above, pale underneath; some specimens (young) rather plain; others with dark blotches, sometimes a pair over shoulders, a second pair somewhat anterior to axil of pectorals, a third pair over bases of ventrals, a fourth pair between ventrals and first dorsal, and a fifth pair just behind base of first dorsal. In two specimens at hand the pairs of blotches tend to run together to form cross bars on the back. Two specimens have scattered pale spots on the body, but not on the tail. The snout is translucent except where the cartilage is situated.

Six specimens, 250 to 465 mm. long, are included in the present collection. The smallest one still shows the umbilical scar. In addition to these, four embryos, 190 to 204 mm. long (U.S.N.M. No. 77599), are at hand. These, including their teeth, are well developed and evidently are part of the eight removed from one fish, 98 cm. long, as reported by Evermann and Radcliffe (1917, p. 13). This material forms the basis for the foregoing description.

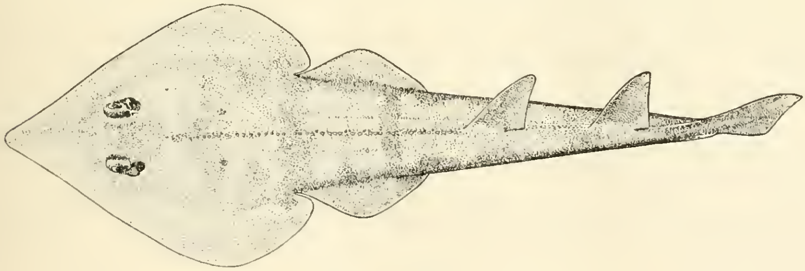

FIGURE 8.—*Rhinobatos planiceps* Garman. From a specimen 763 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77678). (After Evermann and Radcliffe, 1917.)

The specimens in the recent collection were taken in Sechura Bay, at Lobos de Tierra Island, and in Chilca Bay. The "guitarra" was reported as taken in "some quantity" by the Mission 1943 (p. 285) at Chilca, Lobos de Tierra, at La Lagunilla, Nonura Bay, Sechura Bay, Paita Bay, Talara Bay, and at Puerto Pizarro. A length of at least 98 cm. is attained.

It is stated in the report of the Mission (p. 285), presumably according to local statistical records, that the catch comes principally from the general vicinity of Paita and Sechura, and in some quantity also from Pisco. Most of the catch is salted and dried. It is stated, furthermore, that this skate is a cheap fish, that it is regarded as mediocre in quality, and that it is eaten extensively by the poorer people.

Range.—Peru and the Galápagos Islands.

Family RAJIDAE: Skates

Body and head much depressed, united with pectorals, together forming a rhomboid disk; tail rather stout, depressed, with lateral folds, bearing two small dorsal fins; eyes and spiracles superior; mouth small, inferior; teeth small, numerous, in pavement; skin usually more or less rough, with small spines and larger tubercles.

A single genus, as herein understood, is included in the Peruvian collections studied.

Genus PSAMMOBATIS Günther, 1870

Disk more or less circular, with a concavity of varying depths opposite eyes and spiracles; no rostral prolongation of the cranium, the snout being soft and flexible; ventral fins definitely notched, with a somewhat thickened and produced outer lobe; claspers very long, slender, pointed; teeth in transverse rows, varying from more or less flat to sharp and pointed, the cusps apparently larger in males than females. Adult males, as far as known, have sharp spines in parallel rows or in a band on the pectorals toward the outer margins of the widest part of the disk.

Each of the six species herein recognized is based on a single specimen. The specimens all seem to differ rather markedly from each other and must represent species unless great variation exists that cannot be determined until many more specimens are collected. *P. aguja* differs so greatly from the others, especially in the deeply notched ventral fins, large eyes, and narrow interorbital that it perhaps should be considered as subgenerically distinct. It seems advisable, however, to postpone such a designation until relationships are better understood.

KEY TO THE SPECIES

a. Ventral fins deeply notched, inner lobe narrow, strongly convex; eye large, 4.5 in snout; interorbital narrow, 3.6 in snout............. **aguja** (p. 53)

aa. Ventral fins not deeply notched, inner lobe broad, gently convex; eye smaller, 4.25 to 4.9 in snout; interorbital notably broader, less than 2.5 in snout.

  b. Disk very broad, its width 1.15 in total length; tail notably shorter than rest of body; length posterior to vent 2.7 in total length; interorbital little concave, broad, 6.65 in length anterior to vent.....**brevicaudatus** (p. 55)

  bb. Disk narrower, its width 1.3 to 1.4 in total length; tail longer, length posterior to vent, 2.2 to 2.45 in total length.

    c. Eye moderately large, about half width of interorbital, 4.25 in snout; preoral length of snout notably shorter than its length to eye, 4.5 in length anterior to axil of pectoral, and 6.85 in width of disk; color brownish above, with obscure pale spots.......**caudispina**, new species (p. 55)

    cc. Eye smaller, notably less than half width of interorbital, 4.7 to 4.9 in snout; preoral length of snout only a little shorter than its length to eye, 4.1 to 4.3 in length anterior to axil of pectoral and 5.75 to 6.05 in width of disk; color gray above, with more or less distinct black spots.

d. Rudimentary caudal virtually undeveloped, a mere cutaneous ridge; first dorsal notably smaller than the second, base of first 3.3 in snout; mouth rather narrow, its width 1.65 in snout; teeth with round crowns and a low pointed cusp posteriorly; upperparts with few obscure dark spots---------------------- **asper**, new species (p. 57)

dd. Rudimentary caudal much better developed, a prominent cutaneous fold; first and second dorsal of about equal size, base of first 2.65 to 2.95 in snout; mouth wider, 1.45 in snout.

e. Interorbital rather narrow, about 2.25 times diameter of eye, 2.15 in snout, and 9.0 in length anterior to vent; teeth with transversely oblong crowns, and a low transversely broadened cusp becoming pointed at tip; upperparts with numerous distinct black spots. **maculatus**, new species (p. 59)

ee. Interorbital very broad, about 3.25 times diameter of eye, 1.8 in snout, and 7.5 in length anterior to vent; teeth with round crowns, and a prominent central cusp; upperparts with scattered but distinct black spots----------------- **chilcae**, new species (p. 61)

PSAMMOBATIS AGUJA (Kendall and Radcliffe)

Raja aguja Kendall and Radcliffe, 1912, p. 78, pl. 1, figs. 1, 2, Aguja Point, Peru (original description, based on the type and a "cotype"; the cotype, however, apparently is of a different species, and therefore that part of the description pertaining to this specimen, and figure 2, which is based upon it, probably do not apply).—Garman, 1913, p. 358 (description, based on the "cotype," a specimen 286 mm. long, which apparently is not this species).—Beebe and Tee-Van, 1941, p. 254, fig. 12 (range; field characters; size; references; discussion, it being suggested that the type may not be *Psammobatis*).

Malacorhina scobina Tortonese (not of Philippi), 1939b, p. 214, fig. 5, Callao; Peru (synonomy; description).

Disk notably broader than long, with tip of snout scarcely projecting, somewhat convex opposite snout, slightly concave opposite nuchal region, convex elsewhere; width of disk 1.4 in total length; its greatest length 1.77; length anterior to axil of pectoral 2.05; length anterior to vent 2.0; length posterior to vent 2.05; tail depressed throughout, its depth 1.65 its width at axil of ventral, with a slight lateral keel beginning near its base, developing into a cutaneous fold posteriorly, not quite extending to tip of tail; snout rather long, 3.55 in length anterior to axil of pectoral, and 5.15 in width of disk, its preoral length slightly exceeding its length to eye, 3.44 in length anterior to axil of pectoral, 5.0 in width of disk; eye large, its longitudinal diameter somewhat greater than width of spiracle, 4.05 in snout; interorbital narrow, not especially concave, only 1.1 times diameter of eye, 3.6 in snout, 13.0 in length anterior to vent; internarial space considerably narrower than mouth, 2.1 in preoral length; mouth bent forward slightly, its width 1.65 in preoral length, 8.35 in width of disk; teeth in 28 transverse rows, with a round flattened crown, with slightly raised margin, posteriorly with a low pointed cusp; prickles in a band on lower surface of disk along anterolateral margin, a few scattered ones similarly placed on upper surface, a few on interorbital region, beginning again on posterior part of back, and becoming numerous and strong on the dorsal surface of tail, forming a more or less definite lateral series of spines on distal part of tail; no spines on disk, a median series beginning somewhat in advance of axil of pectoral, extending on the tail, the last one being between the dorsal fins; two dorsal fins, about equal in size, separated by a distance nearly half as long as base of fin, the second one separated from the moderately well-developed rudimentary caudal by a distance fully half as great as base; base of first dorsal 4.35 in snout; ventral very deeply notched, the inner part narrow and strongly convex, outer lobe 4.45 in length anterior to axil of pectoral, 6.45 in width of disk.

Color brownish, with pale spots, several small ones mostly near the margins of the disk; a pair of rather larger ones toward margins of disk opposite spiracles, a pair of considerably larger ones opposite nuchal region, and a third pair of still larger ones farther back on the disk, the spots on each side of median line of back of the three pairs being in a straight longitudinal row.

The foregoing description is based on the type, a female 472 mm. long, according to my measurement (480 mm. in original description). This specimen differs prominently from the others at hand in the very deeply notched ventral fins; the large eye; and correspondingly narrow interorbital. According to Norman's revision of this genus and *Raja* (1937), in which this species apparently was not considered, it seems to be most nearly related to *P. scorbina* (Philippi), from which it differs, however, in several respects, as follows: The vent is a little nearer snout than tip of tail; the opposite holds for *scorbina.* The interorbital space is only a little less than the combined longitudinal length of eye and spiracle; equal to or only a little greater than diameter of eye in *scorbina.* Internarial space is broader, 2.1 in preoral length: 2.5 to 3.0 in *scorbina.* Dorsal fins are well separated, with a spine between them; close together or more usually connected in *scorbina.* No nuchal spines present; three or four nuchal spines in *scorbina.* Finally, whereas the lower surface has a broad band of prickles along anterolateral margins of disk in *aguja* it is rather smooth in *scorbina.*

It is judged from the original description and especially from the figures that the paratype of *Raja aguja* probably is a different species. Beebe and Tee-Van (see references above) have suggested that it may even belong to a different genus. However, William C. Schroeder has kindly examined the paratype, which is in the Museum of Comparative Zoology, and has reported that the cranium is not prolonged into the snout. Therefore, it seems to be a *Psammobatis,* though probably not *P. aguja.* If it is not *P. aguja*, it may represent an undescribed form.

Range.—As here understood this species is known only from the type (U.S.N.M. No. 65641) taken by the *Albatross* near Aguja Point, Peru.

PSAMMOBATIS BREVICAUDATUS Cope

Psammobatis brevicaudatus Cope, 1877, p. 32, Pacasmayo Bay, Peru (original description).—Fowler, 1910, p. 471, fig. 2 (description, based on the type).—Garman, 1913, p. 371 (description, based on the type).

?*Malacorhina brevicaudata* Tortonese, 1939a, p. 48, Santa Elena Bay, Ecuador (brief description, based on a female 383 mm. long).

Disk much broader than long, subrhombic, the lateral margins broadly rounded, its width 1.15 in total length; length anterior to vent 1.6; length posterior to vent 2.7; tail with broad lateral fold; snout with a small tubercle below at median point, its preoral length 7.1 in width of disk; interorbital little concave, wide, exceeding combined length of eye and spiracle, 6.65 in length anterior to vent; internarial space comparatively great, distance between outer rim of nostrils being equal to the distance of each from tip of snout, and half as far from margin of disk; spinules on upper surface of head, a broad band on both surfaces of anterior part of disk; two spines on orbital ridge in front of eye, and seven posterior to eye; a row of a few spines between orbit and lateral free border; six to eight on median line of middle portion of back; a series on median line of tail; and a double row parallel to border of pectoral fin; two dorsal fins; caudal fin rudimentary; ventral not deeply notched; claspers four-fifths length of tail.

Upper surface lead color, with indistinct darker shades; middle of anterior portion of snout pale, with a dark spot behind it.

The foregoing account is based on Cope's description, and list of measurements of the type, modified and rearranged to conform as far as possible with the other descriptions of the genus presented. This species is known only from the type, a male 307 mm. long, and a specimen recorded by Tortonese (1939a, p. 48) from Santa Elena Bay, Ecuador, which may or may not be this species. *P. brevicaudatus* differs from all the other species described herein in the very broad disk, short tail, and in the absence of a spine between the dorsal fins (or such a spine at least is not mentioned in the description, or shown by Fowler in his figure based on the type (see reference above).

Range.—Known from Pacasmayo Bay, Peru; recorded also from Santa Elena Bay, Ecuador.

PSAMMOBATIS CAUDISPINA, new species

Platillo; Raya

Figure 9

Raja steindachneri Evermann and Radcliffe, 1917, p. 14, Mollendo and Chimbote. Peru (references; description; discussion. Apparently not of Delfin).

Psammobatis lima Norman, 1937, p. 34 (synonymy; description; range. In part probably not this species).—Fowler, 1941a, p. 226, fig. 4 (references; listed from Mollendo and Chimbote, Peru, presumably after Evermann and Radcliffe, which is not *P. lima*).

Disk much broader than long, with tip of snout scarcely projecting, gently convex opposite snout, slightly concave opposite spiracles, convex elsewhere; width of disk 1.33 in total length; its greatest length 1.85; length anterior to axil of pectoral 2.05; length anterior to vent 2.0; length posterior to vent 2.2; tail depressed throughout, its depth 1.65 in its width at axil of ventral, with a cutaneous lateral fold beginning shortly before end of inner lobe of ventral, increasing in width posteriorly, extending fully to tip of tail; snout moderately short, 3.8 in length anterior to axil of pectoral, and 5.8 in width of disk, its preoral length notably less than its length anterior to eye, 4.5 in length anterior to axil of pectoral, and 6.85 in width of disk; eye moderate, its longitudinal diameter about equal to width of spiracle, 4.25 in snout; interorbital concave, about two times diameter of eye, 2.1 in snout; internarial space somewhat narrower than mouth, 1.3 in preoral length, 6.0 in length anterior to vent, mouth bent forward slightly, its width 1.05 in preoral length, 7.2 in width of disk; teeth in 33 transverse rows, with a round crown surmounted by a sharp central cusp, apparently lost through wear on some of the front teeth; prickles in a broad band on lower surface of disk along anterolateral margin of disk; a similar band on upper surface, except toward tip of snout; scattered minute ones on interorbital region, beginning again in nuchal region and extending backward on the middle of the back

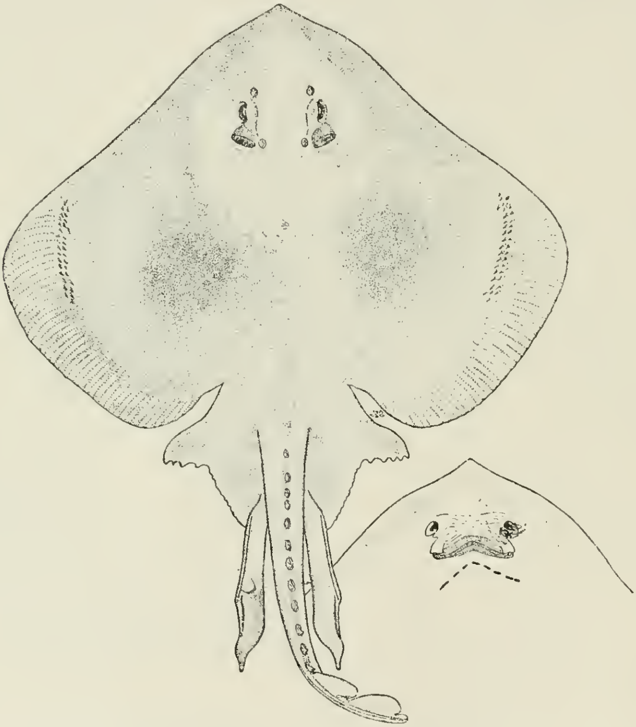

FIGURE 9.—*Psammobatis caudispina*, new species. From the type, 390 mm. long, Chimbote, Peru (U.S.N.M. No. 77710). Insert, ventral view of head.

and on the tail; a low ridged buckler on orbital ridge in front of eye and another behind the eye, a small nuchal spine, and a series of larger ones on median line of tail, the last one being situated between the dorsal fins; two rather definite rows of spines on outer parts of pectoral; two dorsal fins, the second somewhat larger than the first, separated by a distance scarcely more than a fourth as long as base of first dorsal; base of first dorsal 2.9 in snout; second dorsal partly separated from the rather well developed rudimentary caudal by a notch; ventral not especially deeply notched, the outer lobe 3.4 in length anterior to axil of pectoral, 5.15 in width of disk; claspers very long and pointed, extending somewhat beyond origin of first dorsal, 3.3 in total length, equipped with a large flat, sharply pointed spine, bent outward rather sharply.

Color brownish, with rather obscure light spots on middle portion of body from interorbital to base of tail; snout with a large pale area, narrower anteriorly; very small scattered dark specks also present.

The description is based on the type, a male 390 mm. long, the only specimen at hand (U.S.N.M. No. 77710), identified as *Raja steindachneri* Delfin by Evermann and Radcliffe (see reference above), who had a second specimen, which is not available now. However, Norman (1937, p. 34) considered *R. steindachneri* Delfin a synonym of *P. lima* (Poeppig). Although *P. caudispina* is related to *P. lima*, it seems to differ, according to Norman's account of the latter, in several respects as follows: The vent is about equidistant from tip of snout and end of tail in *lima*, whereas it is much nearer end of tail in *caudispina;* the interorbital is 3 to nearly 4 times longitudinal diameter of eye in *lima*, and only about 2 times in *caudispina;* the teeth are in 40 to 44 transverse rows in *lima*, and in only 33 rows in *caudispina;* and the color in *lima* is described as more or less uniform grayish or brownish above, whereas it is brownish with rather large pale spots and a large pale area on snout in *caudispina*.

The name *caudispina* was suggested by the spines on the tail.

Range.—The type, and only specimen known, was taken at Chimbote by R. E. Coker.

PSAMMOBATIS ASPER, new species

PLATILLO

FIGURE 10

Disk rather broad, tip of snout slightly projecting, moderately convex opposite posterior part of snout, gently concave opposite and posterior to spiracle, moderately to strongly convex elsewhere; width of disk 1.3 in total length; its greatest length 1.6; length anterior to axil of pectorals 1.85; length anterior to vent 1.8; length posterior to vent 2.3; tail very strongly depressed, its depth 1.7 in its width at axil of ventral, with a cutaneous lateral fold beginning as a keel opposite extremity of ventral, increasing in width posteriorly; snout moderately long, 3.8 in length anterior to axil of pectoral, and 5.55 in width of disk; its preoral length only a little less than its length to eye, 4.1 in length anterior to axil of pectoral, and 6.0 in width of disk; eye moderately large, its longitudinal diameter scarcely equal to width of spiracle, 4.9 in snout; interorbital moderately broad, concave, about 2.3 times diameter of eye, 2.05 in snout, and 8.0 in length anterior to vent; internarial space and width of mouth equal, 1.5 in preoral length; mouth bent forward very slightly, 9.15 in width of disk; teeth in 32 transverse rows, with a round crown, slightly raised margin, and posteriorly with a low pointed cusp; prickles in a moderately narrow band on lower surface along anterolateral margins of disk, extending back a little beyond posterior rim of spiracles; no prickles on snout or interorbital; a few along inner margin of spiracles; a small patch near margin opposite spiracles; present on back behind nuchal region and continued on dorsal surface of tail; a low star-shaped buckler on orbital ridge in front of eye, and indications of two posterior to eye; a row of 5 median ones in nuchal region; and a row of low, strong sharp spines on tail, the last spine being situated between the dorsal fins; a patch of small spines on pectorals near inner

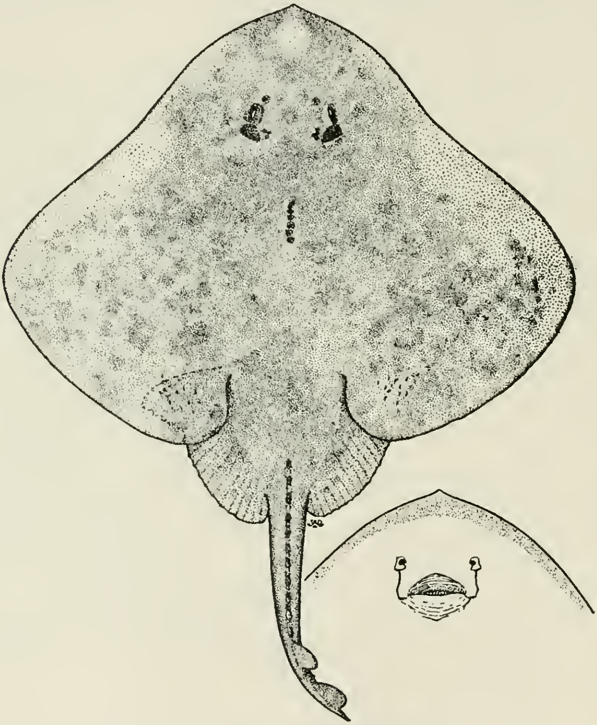

FIGURE 10.—*Psammobatis asper*, new species. From the type, 480 mm. long, Pachacamac Island, Peru (U.S.N.M. No. 127786). Insert, ventral view of head.

posterior border; 2 dorsal fins, separated by a distance a little less than half the base of first dorsal; base of first dorsal 3.3 in snout; second dorsal considerably larger than the first, continuous (without a notch) with the very low, virtually undeveloped caudal, and not extending to end of tail; ventral not deeply notched, the outer lobe greatly thickened, 4.05 in length anterior to axil of pectoral, and 5.8 in width of disk.

Color gray, paler toward margins of disk; a large pale area on end of snout; pectorals largely with rather obscure dark spots; ventrals with very indistinct spots; under parts pale, except posterior parts of disk, which are rather abruptly dusky.

The description is based on the type and only specimen at hand, a female 480 mm. long (U.S.N.M. No. 127786). This species differs from *P. chilcae* in the width and shape of the disk, the broader interorbital, the smaller eye, the fewer spinules and spines, the relative size of the dorsal fins, in the development of the rudimentary caudal fin, in color, and in several other respects, which in part concern the sex. The only specimen of *P. chilcae* known is a male. This species, as well as all the others described herein, differs from *P. brevicaudatus* Cope, according to the description, in having a proportionately broader disk, shorter tail, shorter snout (to mouth), broader interorbital, and in the abundance and position of spinules and spines.

The presence of many spinules and spines suggested the name *asper*.

Range.—The type, and only specimen known, was secured by the Mission at Pachacamac Island with a trammel net set near rocks.

PSAMMOBATIS MACULATUS, new species

RAYA

FIGURE 11

Disk rather broad, tip of snout slightly projecting, only slightly convex opposite posterior part of snout, and scarcely concave opposite and posterior to spiracles, moderately to strongly convex elsewhere; width of disk 1.3 in total length; its greatest length 1.6; length anterior to axil of pectoral 1.8; length anterior to vent 1.75; length posterior to vent 2.45; tail depressed, its depth 2.0 in its width at axil of ventral, with a cutaneous fold beginning somewhat in advance of extremity of ventral, increasing in width posteriorly; snout moderately long, 4.1 in length anterior to axil of pectoral, and 5.75 in width of disk; its preoral length only a little less than its length to eye, 4.3 in length anterior to axil of pectoral, and 6.05 in width of disk; eye moderately large, its longitudinal diameter about equal to width of spiracle, 4.75 in snout; interorbital concave, about 2.25 times diameter of eye, 2.15 in snout, 9.0 in length anterior to vent; internarial space scarcely narrower than mouth, 1.5 in preoral length; mouth bent forward slightly, 1.4 in preoral length, and 9.5 in width of disk; teeth in 34 transverse rows, with an oblong crown, and a rather low, transversely broad cusp, becoming pointed at tip; prickles in a moderately narrow band on lower surface along anterolateral margins of disk, extending back somewhat beyond posterior rim of spiracles; a few prickles on interorbital, and laterally from eye and spiracle, but none on snout or nape; beginning again in nuchal region on back and extending backward on tail; 2 low bucklers on orbital ridge, one in front of eye and one behind it; 6 moderately prominent spines in a median series in nuchal region, followed by very small ones, increasing gradually in size from near base of ventral to the last one on tail, the last being situated between the dorsal fins; a patch of moderately stout spines on pectorals near inner posterior border; two dorsal fins, separated by a distance a little less than a third the length of the base of first fin; base of first dorsal 2.65 in snout; second dorsal scarcely larger than the first, partly separated by a notch from the moderately well developed rudimentary caudal; the latter extending fully to end of tail; ventral with a rather shallow notch, the outer lobe moderately thickened, 4.55 in length anterior to axil of pectoral, and 6.3 in width of disk.

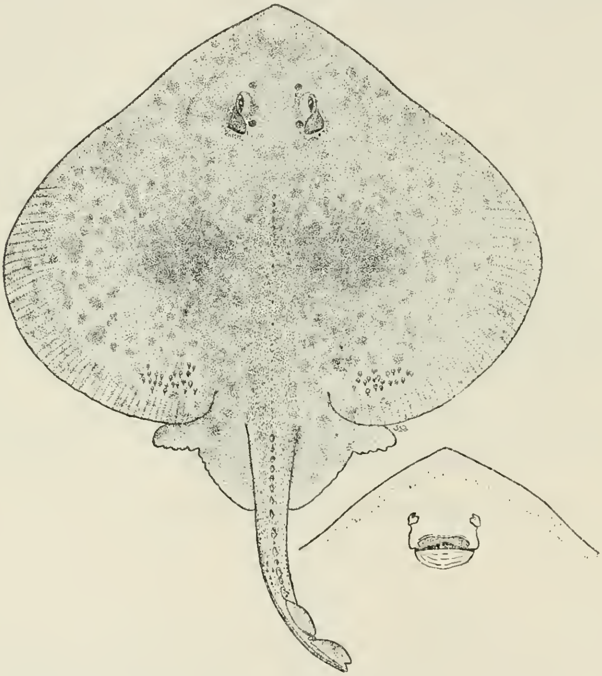

FIGURE 11.—*Psammobatis maculatus*, new species. From the type, 452 mm. long, Guañape Island, Peru (U.S.N.M. No. 127787). Insert, ventral view of head.

Color gray, not especially paler toward margins of disk; a rather small pale area on end of snout, followed by a dark blotch; a pair of large dark blotches on inner parts of pectorals opposite widest portion of disk; upper surface everywhere with distinct dark spots; lower parts mostly pale; posterior parts of disk slightly, though not abruptly, dusky.

The description is based on the type and only specimen at hand, a female, 452 mm. long (U.S.N.M. No. 127787). This species is near *P. asper* from which it differs, as indicated in the descriptions, in the shape of the disk and in the teeth, narrower interorbital, in the abundance and placement of spinules and spines, in the relative size of the first and second dorsal fins, in the development of the rudimentary caudal fin, in the development and shape of ventral fins, in color, and in several other minor respects.

The presence of many dark spots on the upper surface of the animal suggested the name *maculatus*.

Range.—The type, and only specimen known, was secured by the Mission at Guañape Island, on a line trawl in 10 fathoms.

PSAMMOBATIS CHILCAE, new species

FIGURE 12

Disk only moderately broad, with tip of snout scarcely protruding, convex opposite snout, and rather prominently concave opposite spiracles, moderately to strongly convex elsewhere; width of disk 1.4 in total length; its greatest length 1.65; length anterior to axil of pectoral 1.85; length anterior to vent 1.85; length posterior to vent 2.2; tail strongly depressed, its depth 2.15 in its width at axil of ventral, with a rather narrow cutaneous fold, beginning at axil of ventral and extending to its tip; snout moderately long, 4.0 in length anterior to axil of pectoral, and 5.35 in width of disk, its preoral length scarcely less than its length anterior to eye, 4.3 in length anterior to axil of pectoral, and 5.75 in width of disk; eye small, its longitudinal diameter scarcely equal to width of spiracle, 4.7 in snout; interorbital broad, concave, about 3.25 times diameter of eye, 1.8 in snout, 7.5 in length anterior to vent; internarial space slightly narrower than mouth, 1.5 in preoral length; mouth bent forward slightly in middle, its width 1.35 in preoral length, 7.7 in width of disk; teeth in 30 transverse rows, with round crowns, surmounted by a rather large pointed central cusp; prickles in a very broad band on lower surface along anterolateral margin of disk; a patch of prickles on upper surface at margin opposite eyes and spiracles; none on snout, or elsewhere on upper surface of body and tail; 11 bucklerlike spines on median line of tail, only the last one, situated between dorsal fins, with a point; none on disk, except spines toward the outer margins of pectorals, characteristic of males, these in a band about as wide as eye at widest part; 2 dorsal fins of about same size, separated by a distance about a third as long as base of first dorsal; base of first dorsal 2.95 in snout; second dorsal only partly separated from a well-developed rudimentary caudal by a notch; ventral rather deeply notched, the outer lobe 3.8 in length anterior to axil of pectoral, 5.15 in width of disk; claspers very long, pointed, reaching opposite base of first dorsal, 3.3 in total length, equipped with a large, flat, sharply pointed spine, bent outward gently.

General color gray, with ill-defined, dark gray blotches, and scattered but distinct dark spots; dark blotches most definitely outlined on margins of pectorals; one involving a considerable part of snout, with a small pale area within at tip of snout; a pair near margin opposite and posterior to spiracles; and a pair of very large ones on inner parts of pectoral opposite about middle of back; back and tail with obscure dark cross bands.

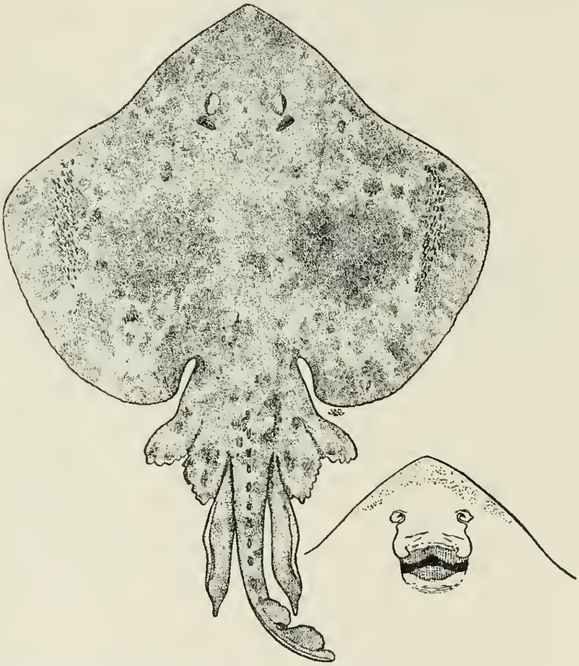

FIGURE 12.—*Psammobatis chilcae*, new species. From the type, 345 mm. long, Chilca Bay, Peru (U.S.N.M. No. 127785). Insert, ventral view of head.

The description is based on the type and only specimen at hand, a male 345 mm. long (U.S.N.M. No. 127785). This specimen differs from all others at hand in the small eye and correspondingly broader interorbital space, wherein it seems to be in agreement with Norman's account of *P. lima*. From the latter it differs, however, in the notably fewer rows of teeth, the number given for *lima* being 40 to 44. It seems to differ further from *lima* in the presence of a spine between the dorsal fins, which is not mentioned in the description and is not shown in Norman's figure. Prominent differences in color also seem to exist, as *lima* is described as more or less uniformly grayish or brownish. The prominent dark blotches and spots in *chilcae* would scarcely have been overlooked. The disk is rounder anteriorly than in the other specimens at hand; the upper surface is smoother; and it alone has no sharp spines, except the ones toward outer parts of pectorals, which probably are present in all males. The spines on pectorals are in a band, however, and not arranged in rows as in *P. caudispina* and in *P. brevicaudatus*.

Range.—The type and only specimen known was secured by the Mission on sandy botton with a seine in Chilca Bay.

Family DASYATIDAE: Sting Rays

Head and body depressed, forming with the pectoral fins a broad disk; pectorals meeting in front of cranium, without a supporting rostral cartilage; tail long or short, with or without a spine; spiracles large, close behind eyes, superior; nostrils confluent, with a broad flap in front of mouth; mouth transverse, more or less curved; teeth numerous, in pavement, usually with ridges or small cusps, skin smooth, or rough with spines and tubercles.

Three genera are represented in the Peruvian collections studied.

KEY TO THE GENERA

a. Tail very long, whiplike, with at least one strong serrated spine. **Dasyatis** (p. 63)

aa. Tail shorter, not whiplike, about equal to or not greatly exceeding length of disk; a narrow caudal fin present________________ **Urotrygon** (p. 64)

aaa. Tail very short, with no caudal fin, with a membranous fold above and sometimes below______________________________________ **Pteroplatea** (p. 71)

Genus DASYATIS Rafinesque, 1810

WHIPTAIL STING RAYS

Disk subtriangular to subcircular; tail long, whiplike, with at least one strong serrated spine, with or without dermal folds behind the spine; upper surface usually more or less spinous or prickly, rarely smooth; mouth usually with a few papillae on inside at base of lower jaw; teeth small, paved; pectorals meeting in front of skull.

One species is known from Peru.

DASYATIS BREVIS (Garman)

RAYA

Trygon brevis GARMAN, 1880, p. 171, Paita, Peru (original description).

Dasybatis brevis GARMAN, 1913, p. 396, pl. 32, figs. 5, 6, Paita, Peru; San Diego, Calif. (synonymy; description; range).

Dasyatis brevis NICHOLS and MURPHY, 1922, p. 504, Paracas Bay, Peru (notes on local abundance, and wounds from spine).—FOWLER, 1941a, p. 228 (references).—BEEBE and TEE-VAN, 1941, p. 260, fig. 22 (range; field characters; size; discussion; synonymy).

Disk somewhat broader than long, its anterolateral margins nearly straight and oblique, meeting at a very broad angle at snout, convex elsewhere, broadest opposite about the third pair of gill slits, its width in total length 2.2; length from tip of snout to posterior margin of disk 2.45; length anterior to axil of pectoral 2.7; length anterior to vent 2.85, length posterior to vent (tail) 1.6; tail about twice as wide as deep at base, nearly round and very slender posterior to caudal spine, with a rather prominent dermal fold above, posterior to spine, the fold scarcely longer than snout in advance of mouth; a broader and longer fold below, beginning somewhat in advance of base of spine, coterminal with the dorsal fold; the main spine with finely serrate lateral edges, about equal to length of snout in advance of mouth, with a short auxiliary spine at base; tip of snout scarcely exserted, its length to eye 4.7 in length anterior to axil of pectoral, its preoral length 5.2; eye notably smaller than spiracle, 15.3; interorbital 9.2; mouth transverse wavy, its width 8.35; teeth in pavement, flat, without cusps; disk smooth, except for a single short strong nuchal spine; ventral broadly rounded, overlapped by pectoral, its outer distal angle scarcely extending beyond margin of disk, its greatest length 4.5 in length anterior to axil of pectoral.

Color uniform bluish gray above; pale underneath; tail posterior to dermal folds black.

This ray is represented by a single specimen, a female 625 mm. long, on which the foregoing description is based. No specimens are available for comparison. According to published accounts the specimen at hand has a rather longer tail and fewer spines than others described and figured. However, the specimen is smaller, which may account for the differences. Garman (1913, p. 397) reported five buccal papillae. I am able to find only three in the specimen at hand.

The specimen in the present collection was taken with a seine in Independencia Bay at Lagunilla. It is stated in the report of the Mission (1943, p. 286), that a "number of sting rays were taken" and, further, "These rayas are considered very dangerous by the fishermen and cases are on record where they have caused severe injury, if not death, to persons hit by the stings." As the rays were not identified as to species in the field, more than one species may be involved. According to Beebe and Tee-Van (1941, p. 261), *D. brevis* attains a length of at least 180 cm.

Range.—San Diego, Calif., to Independencia Bay, Peru, except Central America.

Genus UROTRYGON Gill, 1863

RAYAS

Disk more or less subcircular; snout more or less produced, rather pointed; mouth transverse, somewhat wavy; teeth numerous, in pavement, broader than long, with or without small cusps; tail about equal to or not greatly exceeding length of disk, depressed at base, with a large serrated spine, bearing fin folds posterior to spine, forming a narrow caudal fin; upper surface with or without spines and prickles, most frequently with spines on median line of back and tail.

The species of this genus are not well known. As there probably is considerable variation especially in the development of spines and spinules with age and sex, much larger series of specimens than now available are needed to determine which differences actually are of specific value. While making this study specimens of all the species, exclusive of two, recognized from the Pacific coast of America have been at hand for comparison.

KEY TO THE SPECIES

a. Caudal fin rather wider than eye, broadly rounded; disk smooth, entirely without spines or prickles; tail without lateral spinules; teeth without cusps---------------------------------- **serrula**, new species (p. 65)

aa. Caudal fin narrower, not wider than eye, narrowly rounded; disk with few prickles on snout and a strong nuchal spine; tail with a series of lateral spinules and a series of low tubercles on dorsal fin fold; teeth without cusps----------------------------- **caudispinosus**, new species (p. 67)

aaa. Caudal fin very narrow, sharply pointed; prickles on snout, with or without spines on back; tail without lateral spines; teeth with small cusps. **peruanus**, new species (p. 69)

UROTRYGON SERRULA, new species

FIGURE 13

Disk broader than long, rather pointed anteriorly, its anterolateral margins nearly straight and oblique to opposite front of eyes, convex elsewhere, broadest opposite about the third pair of gill slits; its width 1.8 in total length; its greatest length 1.95; length anterior to axil of pectoral 2.2; length anterior to vent 2.3; length posterior to vent 1.9; tail from axil of ventral to its tip slightly shorter than greatest length of disk, depressed at base, its depth at axil of ventral 1.65 in its width at same place, becoming compressed distally, with a rather broad dermal fold above and below, forming a rather wide, broadly rounded caudal fin, somewhat broader than eye in widest place; caudal spine slender, very sharply pointed, a little longer than the snout, posterior half with sharply serrate margins, except on the spearlike tip; snout little exserted, rather pointed, its length anterior to eye 3.45 in length anterior to axil of pectoral, its preoral length 3.8; interorbital 8.6; internarial space 8.6; eye and spiracle about equal, 4.15 in snout; mouth transverse, its width 8.0 in length anterior to axil of pectoral; teeth with low ridges, but no cusps; disk smooth, entirely without prickles or spines; tail smooth; ventral very broadly rounded distally, the outer (lateral) part not especially produced, 4.8 in length anterior to axil of pectoral; claspers in the probably young male at hand scarcely as long as the fin next to it, and shorter than outer margin of ventral.

Color grayish, the disk with scattered dark specks; plain pale underneath.

This species is related to *U. peruanus*, with which it agrees rather well in shape, though the tail is a little longer. It differs, further, in the absence of spines and prickles on the disk; in the wider, distally rounded caudal fin; and in the absence of cusps on the teeth. It differs from *U. aspidurus* (Jordan and Gilbert) in having a shorter tail (longer than disk in *aspidurus*); in the notably less strongly exserted snout; the larger eye (about 8.5 in snout in *aspidurus*); and in the notably differently shaped ventral fin, which has a nearly straight distal margin with the outer (lateral) part somewhat produced (about 4.0 in length anterior to axil of pectoral in *aspidurus*). From *U. chilensis* (Günther), according to the description and figure, it differs in the narrower disk (1.57 in total length in *chilensis*); and the tail is shorter, although it is described as longer than the disk in *chilensis*, and it seems to bear a broader and more broadly rounded caudal fin. It differs from the type of *U. goodei* (Jordan and Bollman) in the dif-

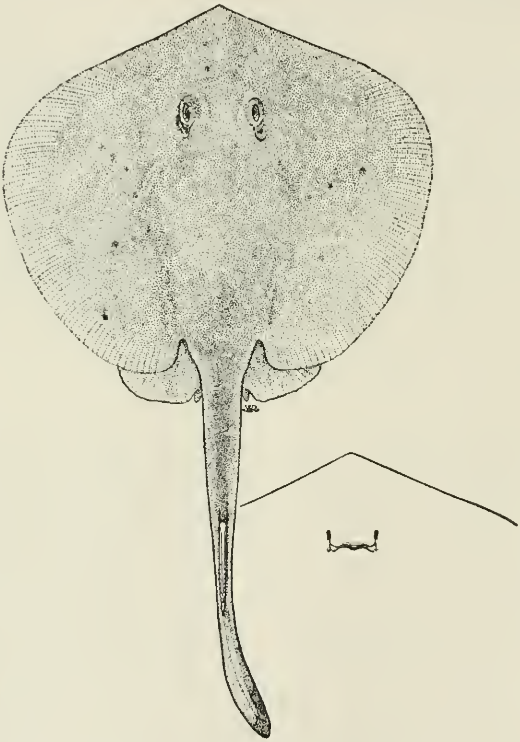

Figure 13.—*Urotrygon serrula*, new species. From the type, 187 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 127795). Insert, diagram of outline of snout and position of mouth and nostrils.

ferently shaped disk, the anterolateral margin being slightly concave at tip of snout and then straight and oblique only for a short distance opposite anterior half of snout in *goodei*, and convex elsewhere; and in the differently shaped ventral fin, which has a nearly straight distal margin, with its outer (lateral) part somewhat produced in *goodei*, 4.15 in length anterior to axil of pectoral.

The sawtoothlike serrations of the caudal spine suggested the name, *serrula*.

Range.—The type (U.S.N.M. No. 127795), a male, 187 mm. long, taken with a seine in Lobos de Tierra Bay, Peru, by the Mission, is the only specimen known.

UROTRYGON CAUDISPINOSUS, new species

FIGURE 14

Disk a little broader than long, rather pointed anteriorly, its anterolateral margins slightly concave opposite tip of snout, then gently convex to opposite eyes, more strongly convex elsewhere, broadest opposite about third pair of gill slits, its greatest width 1.7, 1.8 in total length; its greatest length 1.8, 1.9; length anterior to axil of pectoral 2.15, 2.13; length anterior to vent 2.2, 2.25; length posterior to vent 1.95, 2.1; tail from axil of ventral to its tip shorter than greatest length of disk by fully diameter of eye, moderately depressed at base, its depth 1.25, 1.35 in its width at axil of ventral, becoming compressed distally, with a moderately narrow fold above and below, forming a rather narrow sharply rounded caudal fin, nowhere wider than longitudinal diameter of eye; caudal spine slender, about as long as snout, its margins on posterior half serrate, except at tip, with a blunt auxiliary spine below at base in the type only; snout slightly exserted, quite pointed at tip, its length anterior to eye 3.35, 3.3 in length anterior to axil of pectoral, its preoral length 3.9, 4.1; interorbital 8.9, 9.2; internarial space 9.2, 8.0; eye and spiracle about equal, eye (ball) 4.0, 4.7 in snout; mouth transverse, its width 7.0, 7.8 in length anterior to axil of pectoral, 2.0, 2.3 in snout; teeth mostly flat and smooth; disk smooth except for a few tubercles on the snout and a rather prominent spine in nuchal region; median line of tail with six low spines in advance of caudal spine, and a series of very small slender lateral spines beginning about opposite base of caudal spine, and a series of minute tubercles on the dorsal fin fold; ventral fin distally broadly convex, its outer (lateral) part more than twice as long as its inner part, 4.4, 5.0 in length anterior to axil of pectoral.

Color rather pale grayish, lighter toward margins of disk; most of dorsal surface of disk and tail in the type with scattered dark specks, these scarcely evident in the paratype; plain pale underneath.

The description is based on the type (U.S.N.M. No. 127790), a female 188 mm. long, taken with a seine in Independencia Bay, and a paratype, a male 162 mm. long, caught in a dredge in Sechura Bay. The proportions based on the type are given first in each instance. Both specimens were secured by the Mission.

In addition to the type and paratype, there are at hand three embryos, 118, 119, and 121 mm. long, also secured by the Mission, which were removed from a female taken in Independencia Bay. Unfortunately, the parent is not at hand, and the embryos cannot be identified with any degree of certainty with the present species and therefore should not be regarded as paratypes. The embryos were placed here principally because their general shape agrees, the caudal fins are identical in width and shape, and the ventral fins, too, seem to agree fairly well. The embryos do not agree, however, in color, as they are plain brownish, and of course no spines or tubercles are developed. The teeth in the embryos are fairly well formed, the caudal spine is covered with skin, though serrations are visible, and behind the eye and on the inner margin of the spiracle is a high coiled fold of skin, which evidently is an embryonic character. A similar structure is present also in an embryo removed by the writer from a female *U. asterias* (Jordan and Gilbert) taken in Panama Bay. This external membrane of the embryo presumably is folded downward in the adult when it partly closes the spiracle, which is wide and open in the embryos.

This species is rather close to *U. goodei* (Jordan and Bollman), from which it differs principally in having a nuchal spine, tubercles on the snout, small lateral spines on the tail below the large caudal spine, and small tubercles on the dorsal fin fold. In the presence of lateral spines on the tail and tubercles on the dorsal fin fold, it seems to differ from all other species heretofore described from the Pacific coast of America, except *U. asterias* (Jordan and Gilbert) and a specimen (probably of a different species) at hand from Panama Bay. It differs further from the type of *U. goodei*, now before me, which is plain brownish above, in being gray and having scattered dark specks on the disk and basal part of tail. It differs from *U. serrula* in having a rather rounder (less angular) disk; differently shaped ventral fins; a narrower caudal fin; in the presence of a nuchal spine; and in the presence of spines and tubercles on the tail, as already stated.

The specific name was suggested by the spines on the tail.

Range.—Independencia Bay and Sechura Bay, Peru.

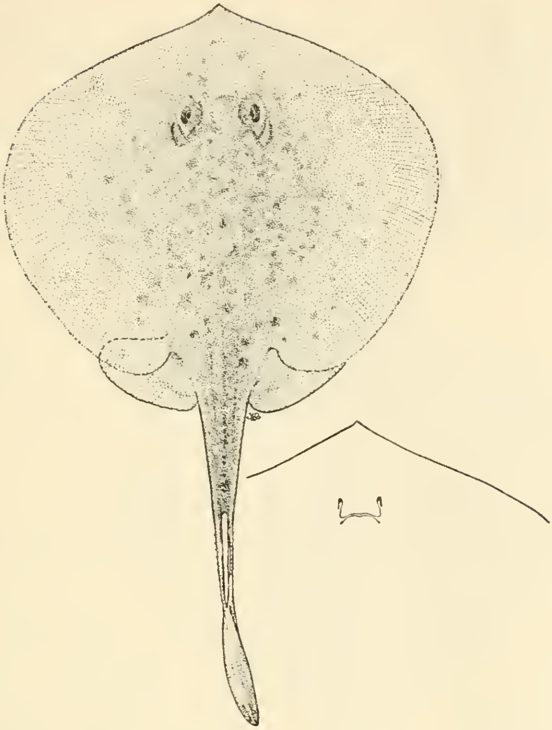

FIGURE 14.—*Urotrygon caudispinosus*, new species. From the type, 188 mm. long, Independencia Bay, Peru (U.S.N.M. No. 127790). Insert, diagram of outline of snout and position of mouth and nostrils.

UROTRYGON PERUANUS, new species

FIGURE 15

Disk broader than long, rather pointed anteriorly, its anterolateral margins nearly straight and oblique, convex elsewhere, broadest opposite about the third pair of gill slits, its width 1.65, 1.7 in total length; its greatest length 1.85, 1.85; length anterior to axil of pectoral 2.05, 2.05; length anterior to vent 2.15, 2.15; length posterior to vent 1.9, 1.95; tail from axil of ventral to its tip shorter than greatest length of disk fully by an eye's diameter, rather broad and depressed at base, its depth about 1.5 times in its width, becoming rather compressed distally, with a narrow dermal fold above and below posterior to caudal spine, forming a pointed caudal fin, narrower than eye at broadest place, being provided distally with rudimentary rays, giving it a featherlike appearance; caudal spine moderately slender, about as long as snout, its posterior half with rather strongly serrate margins except on the spearlike tip; snout somewhat exserted, pointed, its length anterior to eye 3.9, 3.4 in length anterior to axil of pectoral, its preoral length 3.55, 4.0; interorbital 9.5, 9.6; internarial space 8.2, 8.95; eye and spiracle about equal, 3.9, 4.3 in snout; mouth transverse, its width 8.0, 9.5 in length anterior to axil of pectoral; teeth with small sharp cusps; disk smooth except for a patch of prickles on the snout, and some dorsal spines; the larger specimen (type) with an almost continuous median series of spines from nuchal region to caudal spine; the smaller specimen (paratype) with a median series of smaller spines on tail only; ventral very broadly rounded, its outer (lateral) margin 5.4, 5.65 in length anterior to axil of pectoral; claspers short, stout, scarcely as long as the outer margin of ventral.

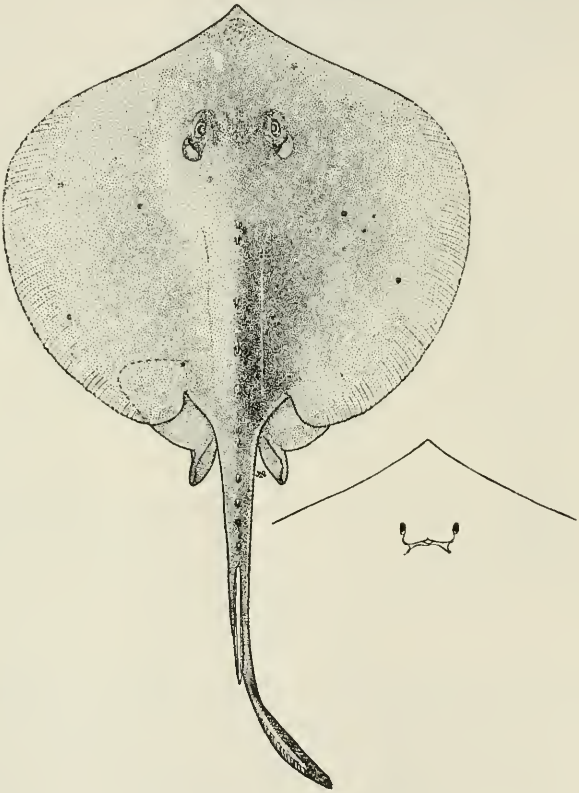

Figure 15.—*Urotrygon peruanus*, new species. From the type, 276 mm. long, Paita Bay, Peru (U.S.N.M. No. 127793). Insert, diagram of outline of snout and position of mouth and nostrils.

Color of the large specimen at hand nearly plain grayish brown above, with few very small scattered dark spots; pale underneath; a smaller specimen more grayish, with rather numerous dark spots; a very small specimen plain gray.

Two specimens—the type (U.S.N.M. No. 127793), a male, taken with a gill net in Paita Bay, 276 mm. long, and a paratype, also a male, taken with a trammel net at La Lagunilla, having a length of 252 mm.—are at hand. The proportions given first in each instance apply to the type. The two specimens differ in the number of spines on the back and somewhat in color, as pointed out in the description. The differences are believed to constitute individual variations and possibly in part variations with age. A very young individual, a male 78 mm. long, from Sechura Bay, which has no spines or prickles, apparently also belongs here.

This species is related to *U. chilensis* (Günther), but according to the description and figure the tail is proportionately longer in the latter, being longer than the disk and contained 1.75 times in total length; the caudal fin is less strongly pointed; and the disk is wider, its width being contained 1.55 in total length; also prickles on the snout are not mentioned. *U. peruanus* differs from all the other species of which specimens are available for examination, including *mundus*, *asterias*, *aspidurus*, and *goodei*, in the narrower and more sharply pointed caudal fin.

Range.—Known only from Peru from the specimens listed above.

Genus PTEROPLATEA Müller and Henle, 1837

Disk much broader than long, the anterior angle equal to or greater than a right angle, the lateral angles acute; tail much shorter than the disk, slender, with or without a spine, without a fin, usually with a membranous fold along median line above and below, the lower one sometimes missing; skin usually entirely smooth.

PTEROPLATEA AFUERAE, new species

TUYO

FIGURE 16

Pteroplatea crebripunctata EVERMANN and RADCLIFFE, 1917, p. 16 (not of Peters), Lobos de Afuera, Peru.

Gymnura crebripunctata FOWLER, 1941a, p. 228 (in part not of Peters) (references).

Gymnura marmorata BEEBE and TEE-VAN, 1941, p. 263, fig. 25 (in part not of Cooper) (range; field characters; references).

Disk much broader than long, its outline opposite snout, eyes and spiracles straight, slightly concave opposite gill slits, from there to outer tip very slightly convex, its distal margin very broadly and gently convex, its lateral angles acute; its length 1.75 in its width, 1.25 in total length; length anterior to axil of pectoral 2.0 in width; length anterior to vent 2.1 in width; tail very short and slender, 3.5 in total length, 5.0 in width, with an extremely narrow fold above and none below; snout moderately pointed, with an angle of about 110°, its length to eye equal to its preoral length, 4.2 in length anterior to vent; eye notably smaller than spiracle, 5.7 in snout; interorbital space flat to slightly concave, 1.35 in snout, 5.7 in length anterior to vent; space between spiracles notably narrower, 1.45 in snout, 6.15 in length anterior to vent; mouth transverse, its width 1.6 in snout, 6.65 in length anterior to vent; teeth small, pointed, in a narrow band in each jaw; ventral narrow, distally convex, its outer margin 4.3 in length anterior to vent; clasper reaching about half its length beyond adjacent part of ventral.

Color of old preserved specimen brown above, "mingled olive green and olive brown" in life, with pale spots about as large as pupil rather widely scattered over the disk, each spot surrounded by a more or less definite dark ring; disk also with light and dark markings, these most conspicuous on anterior part of disk; pale underneath; "posterior border of disk above of a dark reddish color * * *"; lower border of same color in life. Quotations are from Evermann and Radcliffe (see reference above).

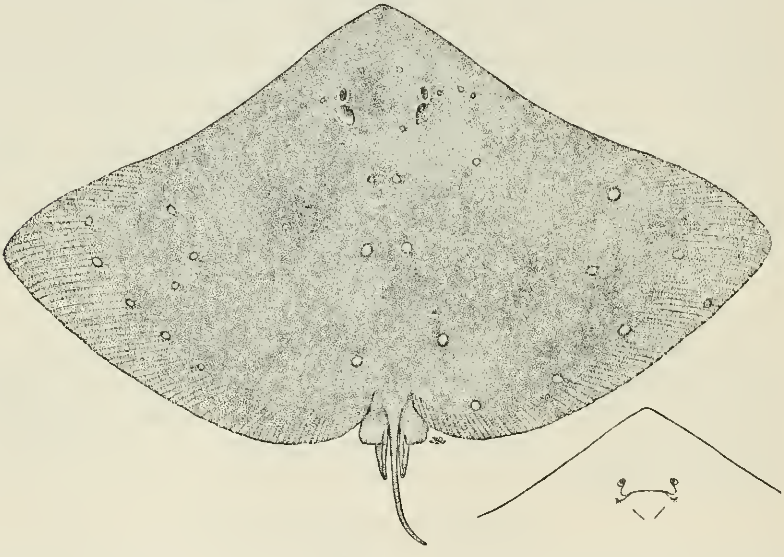

Figure 16.—*Pteroplatea afuerae*, new species. From the type, 353 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 77709). Insert, diagram of outline of snout and position of mouth and nostrils.

The description is based on a male, having a length of 353 mm. and a width of 500 mm. (U.S.N.M. No. 77709), secured at Lobos de Afuera Island, Peru, by R. E. Coker. This is the specimen identified as *P. crebripunctata* Peters by Evermann and Radcliffe (see reference above).

Upon comparing the Peruvian skate with two smaller specimens, 157 and 290 mm. wide, from Mazatlán, Mexico (U.S.N.M. Nos. 47497 and 28298), identified as *P. crebripunctata* (=*P. marmorata*), it was found that the fish from the two localities differ in several respects. Some of the differences may be attributable to the differences in age and size, though it seems highly improbable that all of them can be accounted for in that way.

The disk in the Peruvian fish differs both in shape and proportions. It is more pointed anteriorly, the snout forming an angle of about 110°, and its margins opposite snout, eyes, and spiracles are straight. In the Mexican fish the snout forms an angle of about 125°, and its margins opposite the snout, eyes, and spiracles are definitely convex. The differences in proportions are shown in table 1.

The eye in the Peruvian fish is much smaller than the spiracle, the longest diameter of eyeball being only about three-fourths the longest diameter of the spiracle. In the Mexican skates the eye and spiracle are about equal in size. Some differences in proportions of the eye, interorbital space, interspiracular space, and snout are shown in table 1.

The teeth in the Peruvian specimen are not definitely in pavement but are in a band, each tooth having a very small base, which is transversely scarcely elongate, and each has a prominent cusp. In the larger Mexican specimen, also a male, the teeth definitely are flat and in pavement, each tooth having a broad, transversely elongate base and a very small cusp posteriorly.

The claspers in the Peruvian specimen, though the fish is much larger than the larger Mexican specimen, are proportionately shorter. In the former the part of the clasper free from the ventral is notably shorter than the fin, whereas in the latter the free part is about equal to the length of the ventral. Some proportions are shown in table 1.

Whether the specimens reported as *P. crebripunctata* from Panama by Gilbert and Starks (1904, p. 18) belong to either species compared in the preceding paragraphs cannot now be verified from specimens, as no Panama material is at hand. Insufficient specimens obviously are available to determine variations. It is possible, though improbable, when more specimens become available for study, that all the Pacific coast specimens from the Americas may be found to be of one species. It seems advisable at present to consider the Peruvian skate as specifically distinct from the Mexican one.

The Peruvian skate also was compared with two males, 330 and 335 mm. wide (U.S.N.M. No. 94545), from Corpus Christi, Tex., identified as *P. micrura*. In general, the differences in the shape of the disk are the same as in the Peruvian and Mexican skates, and the differences in the teeth also are the same. The claspers in Texas specimens agree essentially in size and proportions with those of Peruvian fish, these organs in examples of about the same size being decidedly smaller than in the Mexican fish. The Texas fish differ from both Pacific coast species in having a slight fold on the median line of the ventral surface of the tail and a larger one above, and in the plainer color, round white spots being entirely wanting. Some proportional differences are evident from table 1.

Range.—Known only from Lobos de Afuera Island, Peru.

TABLE 1.—*Some proportions in three species of* Pteroplatea

Character	*micrura*, 2 specimens, 330 and 335 mm. wide	*marmorata*, 2 specimens, 157 and 290 mm. wide	*afuerae*, 1 specimen, 353 mm. wide
Total length, in width of disk	1.25, 1.2	1.35, ——	1.4
Length of disk, in width of disk	1.45, 1.55	1.65, 1.7	1.77
Length anterior to axil of pectoral, in width of disk	1.7, 1.75	1.95, 1.85	2.0
Length anterior to vent, in width of disk	1.75, 1.8	1.95, 1.9	2.1
Length posterior to vent (tail), in width of disk	4.6, 4.3	4.9, ——	5.0
Interorbital space, in length anterior to vent	6.3, 6.0	5.65, 5.55	5.7
Snout to eye, in length anterior to axil of pectoral	3.8, 4.05	4.4, 5.0	4.4
Snout to mouth, in length anterior to axil of pectoral	3.3, 3.8	4.3, 4.4	4.4
Interorbital space, in length anterior to axil of pectoral	6.55, 6.3	5.55, 5.8	5.95
Interspiracular space, in length anterior to axil of pectoral	6.2, 6.1	5.7, 6.0	6.4
Internarial space, in length anterior to axil of pectoral	9.0, 9.0	8.5, 8.75	8.6
Width of mouth, in length anterior to axil of pectoral	6.5, 6.65	5.3, 6.0	7.0
Eye, in interorbital space	3.7, 4.2	3.1, 3.7	4.2
Length of clasper, in length anterior to vent	4.75, 4.4	——, 3.6	4.5

Family AETOBATIDAE: Eagle Rays

Body, head, and pectorals forming a very broad disk; pectorals united or free from rostral or cephalic fins in front of snout, the latter united or appearing as two fleshy projections; tail long, whiplike, bearing a serrated spine and a small dorsal fin in front of it; teeth large, flat, more or less hexangular, the middle ones usually broader than the outer ones; eyes prominent, lateral; spiracles large, behind eyes; skin smooth.

A single genus is represented in the Peruvian collections studied.

Genus AETOBATUS Blainville, 1816

Disk much broader than long; outer angles of pectoral fins acute; pectorals continued as a rather narrow lobe around the snout; teeth in several rows, low, broad, and flat, the median ones transversely elongate, two or more times as large as the outer ones; nasal valves confluent, with a broad free flap in front of mouth; ventral fins short and broad.

AETOBATUS PERUVIANUS (Garman)

'RAYO'

Myliobatis californicus ABBOTT, 1899, p. 331 (not of Gill), Callao, Peru (notes on specimen 470 mm. wide).—EVERMANN and RADCLIFFE, 1917, p. 17 (not of Gill), Callao and Paita, Peru (description).

Myliobatis peruvianus GARMAN, 1913, p. 430, pl. 36, figs. 4–6, no locality stated (original description).

Holorhinus peruvianus FOWLER, 1941a, p. 228 (references).

Aetobatus peruvianus BEEBE and TEE-VAN, 1941, p. 271, fig. 34 (references; note).

Disk nearly twice as wide as long; pectoral extending forward to below posterior margin of eye, its anterior margin almost straight nearly to tip, its distal margin very broadly and gently concave, its outer angle round, its posterior angle somewhat narrower, length anterior to margin of posterior angle of pectoral 1.95 in width of disk; length anterior to axil of pectoral 2.05; length anterior to vent 2.1; tail very slender, whiplike, a little more than twice the length of disk, rather broad and depressed at base, its width at axil of ventral rather more than 1.5 times its depth at same place, and rather less than 1.5 times longitudinal diameter of eyeball, bearing a serrated spine (missing in the specimen at hand); spine preceded by a small dorsal fin; snout broadly rounded, its length to eye 5.15 in length anterior to vent, its length to mouth 6.1; internarial space 8.8; nostrils with a continuous fringed flap, with slightly concave margin; mouth transverse, its width 1.1 in interorbital; teeth flat, the middle ones transversely elongate, with three or four square ones on each side; ventral broadly convex, its anterior margin 4.25 in length anterior to vent; claspers very small in specimen at hand, shorter than ventral, very probably immature.

Color of old preserved specimen uniformly grayish brown above; pale underneath. Described by Evermann and Radcliffe (see reference above), when the specimen had been in alcohol a much shorter time, as follows: "Dusky brown, a light line originating under middle of spiracle, extending backward along base of pectorals, from this 10 or more transverse lines extending across pectorals, these narrow bands or lines have well-defined edges but differ so little in coloration from the ground color as to be easily overlooked; ventral surface light."

The description is based on the only specimen available (U.S.N.M. No. 77700), a male, purchased from fishermen by R. E. Coker at Paita, Peru, July 22, 1908. The specimen has a total length of 995 mm. and a width of 440 mm. and is the same specimen described as *Myliobatis californicus* by Evermann and Radcliffe (1917, p. 17). However, Garman (1913, p. 430) recognized a Peruvian specimen as distinct from *A. californicus*, giving it the name *Myliobatis peruvianus*. The specimen now at hand agrees essentially with Garman's description and figures. It is not clear, however, from Garman's account just wherein *peruvianus* differs from *californicus*, and its distinctness has been questioned.

The Peruvian specimen now has been compared with two specimens, also males (U.S.N.M. Nos. 93098 and 61231), 282 and 313 mm. wide, from San Diego and from San Pablo Bay, Calif. As the specimens are unequal in size the comparison is not altogether satisfactory. It seems improbable, however, that the rather numerous differences noticed are all due to the differences in size and age.

The seemingly important differences are as follows: The posterior angle of the pectoral fin is less strongly pointed, and its posterior margin is notably less deeply concave in the Peruvian than in the California fish; the distance from the mouth to the last gill slit is contained somewhat less than 1.5 times in distance from the last gill slit to the vent in the Peruvian skate and nearly 2.0 times in the California specimens. Other proportional differences that may be significant are the following in which the ones applying to the Peruvian example in each instance are given first: Length of disk, 1.95, 1.6, and 1.7 in its width; length anterior to first gill slit 2.6, 2.9, and 3.05 in length anterior to vent; interorbital 5.05, 5.4, and 5.9 in length anterior to vent; preoral length of snout 6.1, 5.35 and 5.4 in length anterior to vent; eyeball 2.8, 2.0, and 2.05 in interorbital.

Range.—Known only from Peru.

Family CALLORYNCHIDAE: Elephantfishes

This family is readily distinguished from the other chimaeras by the peculiarly developed proboscis, which is produced into a leaf-shaped flexible appendage, the "leaf" being placed at a right angle to the rest of the proboscis, hanging in front of the mouth and apparently shielding it. Body compressed, tapering posteriorly, the tail becoming slender; first dorsal near occiput with a strong spine; second dorsal rather far removed from the first; caudal with a long upper lobe, with or without a filament, the lower lobe generally little produced; anal small, placed near lower lobe of caudal and behind second dorsal; pectorals large, free; vomerine and palatine laminae each provided with one or two tritors; lateral line present; male with simple claspers, each with strong frontal and pelvic tenacula.

Only one genus is known.

Genus CALLORYNCHUS Gronovius, 1763

The characters of the genus are those of the family.

CALLORYNCHUS CALLORYNCHUS (Linnaeus)

Ñato; Peje-gallo

Chimaera callorynchus Linnaeus, 1758, p. 236, after *Callorynchus* Gronovius, 1754, p. 59, tab. 4, figs. 1 and 2, nonbinomial, "Habitat in mari Aethiopico" (Gronovius did not give a locality, however, in the work cited. In his "Catalogue of Fishes," published posthumously, and referred to below, in which he definitely cited his earlier work, he gave the habitat as "Mari Chiliense ac Pacifico." The last-mentioned habitat apparently may be accepted as the type locality).

Callorynchus elephantinus Gronovius, edited by Gray, 1854a, p. 15, "Habitat in Mari Chiliense ac Pacifico" (among other references is one to his earlier work cited above).

Callorhynchus callorhynchus Starks, 1906, p. 764, Callao, Peru.—Garman, 1911, p. 98, "Off the coasts of Chile and Peru" (synonymy; description).—Evermann and Radcliffe, 1917, p. 18, La Ventanilla, Peru.—Fowler, 1941a, p. 228 (references).

Head and body anteriorly deep, much compressed, tapering strongly posteriorly; depth at origin of first dorsal nearly twice as great as its thickness, 3.8 in length anterior to base of upper lobe of caudal; depth at origin of anal scarcely greater than thickness, 4.25 in head; head with steep anterior profile, its length without proboscis 3.75 in length; snout without proboscis 4.4 in head; eye placed near dorsal contour, 5.35; interorbital 3.4; gill opening slightly oblique, a little longer than eye; palatine and mandibular lamina each with a single rather broad tritor on each side, the palatine tritor U-shaped, with the outer prong much shorter than the inner one; lateral line wavy, much branched on head; mucous pores on head numerous, especially prominent over eye; first dorsal beginning nearly an eye's diameter in advance of insertion of pectoral, the spine rather long, somewhat curved, with small barbs posteriorly, failing to reach second dorsal by about three times diameter of eye, 3.1 in length; origin of second dorsal nearly an eye's diameter in advance of base of ventral, its base 3.35 in length; caudal with a rather robust (in comparison with other specimens examined), much produced upper lobe, without a filament, or broken away if ever present and surface healed without producing a new filament; the lower lobe little exserted; anal small, close to, yet fully separated from lower lobe of caudal, its tip and that of lower lobe of caudal coterminal, its base 3.3 in head; ventral broad, its outer lobe slightly projecting, 4.75 in length; claspers slender, extending about an eye's diameter beyond adjacent ventral margin; pectoral very large, with greatly thickened base, reaching nearly to middle of base of ventral, 2.55 in length.

Color pale silvery; back largely black, with some indication of breaking up into spots; sides with two rows of large round black spots, the upper row partly in the lateral line and the other below it, and ending in a spot in the axil of ventral; fins largely dusky, the first dorsal with a black spot at base.

The specimen described apparently is a mature male with claspers and frontal and pelvic tenacula developed. It is 385 mm. long to the base of upper lobe of caudal and has a total length of about 580 mm. It was caught in an otter trawl near Coles Point on sandy bottom in 10 to 15 fathoms. It is evident from a comparison of the fish described with a female (U.S.N.M. No. 77722) 580 mm. long to base of caudal, taken at La Ventanilla, Peru, reported upon by Evermann and Radcliffe (1917, p. 18), with a male (U.S.N.M. No. 50305) 440 mm. to base of caudal, from Lota, Chile, and with a male and female (U.S.N.M. Nos. 86719 and 87696), 443 and 507 mm. long to base of caudal, from Uruguay, that considerable variation exists among specimens. The variation includes such characters as the place of the origin of the dorsal with respect to the pectoral, the length of the pectoral, and the length of the dorsal spine, all characters that have been considered important in the recognition of species. According to Garman (1911, p. 97), at least, the specimen described above, on the basis of the length of the pectoral and the origin of the first dorsal with respect to the insertion of the pectoral, is *C. capensis* Duméril, recorded only from southern Africa. The tritors of the palatine lamina, however, are as described for *C. callorynchus*, that is, the outer prongs of the U-shaped tritors are much shorter than the inner ones. The identification of the specimen here described with either of the species named requires the assumption that its caudal filament was lost during life and that the broken surface healed without producing a new filament.

Two other species, *C. smythii* Lay and Bennett and *C. tritoris* Garman, the latter being based on a "nearly complete skeleton," have been reported from Peru. However, there has been disagreement among ichthyologists as to their validity. After discussing variations occurring with age and among individuals in the dental laminae in connection with variations in the length of the pectoral fins, Norman (1937, p. 35) concluded, "It is probable that the examination of an adequate series of specimens would show that the nominal species *capensis*, from South Africa, and *milii*, from Australia, Tasmania, and New Zealand, are nothing more than varieties of *C. callorhynchus*."

Range.—Off coasts of South America from southern Brazil to Peru (Norman, 1937, p. 35).

Family ELOPIDAE: Big-eyed Herrings

Body elongate, more or less compressed; belly not compressed, its median line covered with ordinary scales; eye large, with adipose tissue in large examples; mouth large, terminal or superior; maxillary extending far beyond eye; premaxillaries not protractile; an elongate bony plate (gular plate) between branches of lower jaw; teeth all small, often bluntly villiform, present on jaws, vomer, platines, pterygoids, tongue, and basibranchials; branchiostegals about 25 to 35; gill membranes separate, free from the isthmus; opercular bones with membranous borders; gill rakers moderately long; last several segments of spinal column directed upward; scales large or small, with membranous borders, not extending on head, the median row in front of dorsal not enlarged or modified; dorsal fin over or somewhat behind ventrals; caudal forked; pectorals and ventrals similar, each with a long scale in axil.

The Elopidae generally are considered as among the most archaic of the existing teleosts. A single genus and species is known from Peru.

Genus ELOPS Linnaeus, 1766

Body rather elongate; vertebrae about 75; pseudobranchiae large; branchiostegals about 30; mouth nearly horizontal and almost terminal; lateral line straight, with simple tubes; scales small, forming a sheath on base of dorsal and anal; dorsal fin rather high anteriorly, the last ray not produced; anal similar to dorsal, but smaller, placed far behind dorsal; ventrals inserted near vertical from origin of dorsal.

ELOPS AFFINIS Regan

Elops affinis Regan, 1909, p. 38, Mazatlán and Jalisco, Mexico (original description).—Meek and Hildebrand, 1923, p. 176, Panama Bay (compared with *E. saurus*).—Hildebrand, 1943b, p. 90 (compared with *E. saurus* and *E. senegalensis*).

Head 3.8 to 4.2; depth 5.3 to 5.7; D. 23 or 24; A. 15; P. 16; scales 13–104 to 114.

Body rather elongate, moderately compressed; caudal peduncle rather long, its depth 2.9 to 3.2 in head; head low, long, flat above; snout rather broad, 4.1 to 4.4 in head; eye 4.3 to 4.8; mouth very large, the maxillary reaching well beyond posterior rim of orbit, 1.65 to 1.75 in head; gill rakers at angle of arch exceeding half diameter of eye, 10 or 11+16 to 18; origin of dorsal at least an eye's diameter nearer base of caudal than tip of snout, its outer margin deeply concave, the longest rays reaching nearly or quite to tip of last ray if deflexed; caudal deeply forked, the lobes of about equal length; anal fin notably smaller than the dorsal, its origin about equidistant from vertical of origin of dorsal and base of caudal, its base 2.5 to 2.6 in head; ventral inserted slightly in advance of dorsal, reaching about halfway to origin of anal; pectoral similar in size and shape to ventral, reaching rather less than halfway to ventral, 1.8 to 1.85 in head; axillary scale of pectoral long, slender, 3.1 to 3.6 in head.

Color of preserved specimens bluish gray to brown above, sides bright silvery; dorsal, caudal, and sometimes the pectoral partly dusky; other fins pale.

The description is based on three specimens from Peru, respectively 315, 335, and 465 mm. long. The two smaller ones were taken at Paita, Peru, by W. L. Schmitt, and the largest one was seined at Lobos de Tierra Island, Peru, by the Mission. The specimens were compared with one from Guayaquil, Ecuador, several from Panama Bay, and one each from Guaymas, Lerdo, and Mazatlán, Mexico. *E. affinis* seems to differ from *E. saurus* of the Atlantic only in having more numerous gill rakers.

Range.—Gulf of California to Peru, at least as far south as Lobos de Tierra Island.

Family CLUPEIDAE: Herrings

Body oblong or elongate, more or less compressed; belly compressed, with bony scutes; mouth rather large, usually terminal, sometimes superior; premaxillaries not protractile, maxillary with broad supplemental bones; teeth usually small, or wanting, variously arranged; gill rakers generally long and slender; lateral line absent; scales thin, smooth or pectinate, often lost in preserved specimens; dorsal fin present (in Peruvian species), single, median or posterior in position; no adipose; caudal forked; anal usually rather long; ventral moderate or small, sometimes missing; vertebrae about 40 to 55.

KEY TO THE GENERA

a. Anal fin rather short, with only about 15 to 25 rays; ventral fins inserted under base of dorsal.

b. Last ray of dorsal greatly produced, filamentous; dorsal with about 15 to 18 rays; anal with about 17 to 22 rays; a dark shoulder spot usually present-- **Opisthonema** (p. 80)

bb. Last ray of dorsal not especially produced.

c. Back anterior to dorsal fin compressed and armed with bony scutes; gill rakers numerous, those of upper limb extending downward and forward across those of lower limb; ventral with 7 rays--- **Ethmidium** (p. 82)

cc. Back rounded, not armed with bony scutes; ventral with 8 rays.

d. Gill rakers very long and numerous in adult, about 100 on lower limb in large specimens, those of upper limb extending downward and forward across ones on lower limb; ventral scutes weak, sometimes not definitely countable posterior to ventral fins; vertebrae about 50--- **Sardinops** (p. 86)

dd. Gill rakers shorter and fewer, only about 30 to 35 on lower limb of first arch, those of upper limb not overlapping ones on lower limb; ventral scutes strong, about 26 to 32 present; vertebrae about 40 to 44.

e. Rim of shoulder girdle with 2 small fleshy lobes on its vertical margin; upper limbs of first pair of gill arches with a forward projection between them, generally bearing from one to several short rakers on each side; no silvery lateral band present----- **Harengula** (p. 88)

ee. Rim of shoulder girdle without fleshy lobes on its vertical margin; no median forward projection between upper limbs of the first pair of gill arches; a broad lateral band present-------------- **Lile** (p. 90)

aa. Anal fin very long, with about 45 to 65 rays; ventral fins, if present, inserted in advance of dorsal.

f. Ventral fins present; origin of dorsal about equidistant from tip of mandible and base of caudal------------------------------------- **Ilisha** (p. 91)

ff. Ventral fins absent; origin of dorsal definitely nearer base of caudal than tip of mandible.

g. Maxillary normal, not produced, ending under eye; anal very long, with about 60 rays------------------------------- **Opisthopterus** (p. 92)

gg. Maxillary greatly produced, reaching gill opening in large specimens; anal shorter (in Peruvian species), with about 45 rays. **Odontognathus** (p. 94)

Genus OPISTHONEMA Gill, 1861

Body compressed, back rounded, chest and abdomen with a sharp edge, bearing about 30 to 36 scutes; teeth absent; opercle with a deep indentation over the dermal projection on shoulder girdle in advance of pectoral; branchiostegals 6, membrane of the right side folded over the isthmus underneath that of the left side; scales about 45 to 55 in lateral series; vertebrae about 48; dorsal near middle of body, with about 17 to 22 rays, the last ray greatly produced, filamentous; anal with about the same number of rays, the last ray somewhat enlarged; ventral inserted under base of dorsal, with 8 rays.

A single species, closely related to the Atlantic species *O. oglinum*, comes within the scope of the present work.

OPISTHONEMA LIBERTATE (Günther)

Meletta libertatis GÜNTHER, 1866, p. 603, La Libertad, El Salvador (original description, based on a specimen 2½ inches long).

Opisthonema libertate MEEK and HILDEBRAND, 1923, p. 188, Panama Bay (synonymy; description; compared with *O. oglinum;* range).

Head 4.1; depth 2.85; D. 18; A. 20; P. 15; scales 53.

Body moderately compressed, its greatest thickness nearly equal to depth at origin of anal; caudal peduncle rather deeper than long, 2.6 in head; head rather compressed, its greatest thickness exceeding length of snout and eye somewhat; snout moderately pointed, 4.15 in head; eye 4.15, with little adipose tissue; mouth rather small, lower jaw slightly projecting; maxillary about three-fourths width of eye, its lower margin convex, posteriorly broadly rounded, reaching opposite anterior margin of pupil, 2.65 in head; mandible 2.4; gill rakers long, slender, close-set, very numerous; scales rather firm, with rough margins, especially along the back, with one principal vertical radius and sometimes with one or two partial ones; ventral scutes only moderately strong, 18 in advance of ventrals and 18 more behind them; dorsal in advance of middle of body, its origin about equidistant from tip of snout and vertical from middle of base of anal, distance anterior to its origin 2.2 in length, the fin somewhat elevated anteriorly, its margin concave, longest rays 1.7 in head, filament of posterior ray nearly reaching base of caudal; anal low, last ray somewhat enlarged, its origin about equidistant from tip of ventral and base of caudal, its base 1.55 in head; ventral inserted under anterior half of base of dorsal; pectoral pointed, failing to reach base of ventral by nearly length of snout and eye, 1.4 in head, 5.65 in length.

Color in alcohol bluish above, scales with greenish reflections; the bluish color changing to silvery somewhat above middle of side; dorsal and caudal mostly dusky, the tips of the latter black; other fins pale, exclusive of upper ray of pectoral which is dusky; a distinct dark shoulder spot present, followed by smaller obscure dark spots, not definitely in rows; no lines along the rows of scales on the back; snout and tip of mandible very dark.

A single specimen 270 mm. long (205 mm. to base of caudal), taken in a trammel net in Sechura Bay, is included in the collection. It lost a ventral fin during life, only a scar at the point of insertion remaining. This species was not recorded previously from Peru or apparently from Ecuador. However, a specimen (U.S.N.M. No. 94013) 85 mm. long, from La Plata Island, Ecuador, was collected by W. L. Schmitt, and the species has been recorded from the Galápagos Islands. Several specimens from those islands and Panama Bay were compared with the ones from Peru and Ecuador. The specimens from the southern areas agree admirably and differ only slightly from specimens from Panama Bay in having a somewhat more projecting mandible and rather shorter pectoral fins. However, the Panama material, too, varies somewhat in these respects.

Range.—Mexico (at least as far north as Guaymas, whence I have seen specimens) south to Peru (Sechura Bay), and the Galápagos Islands.

Genus ETHMIDIUM Thompson, 1916

Body elongate, rather strongly compressed; midline of abdomen sharply compressed, with moderately strong scutes; back in advance of dorsal also with a row of scutes on midline; mouth rather large; maxillary about half width of eye, reaching approximately to vertical from posterior margin of eye; upper jaw with a definite notch; teeth absent; gill rakers numerous, those of upper limb extending downward and forward across those of lower limb; no dermal flap on shoulder girdle; scales regularly placed, with vertical radii, about 50 to 55 in lateral series; vertebrae about 48; dorsal more or less over middle of body, with about 16 to 20 rays; anal with rather fewer rays, the last ray slightly enlarged; ventral with 7 rays.

Some writers have referred the species of this genus to *Potamalosa* Ogilby, based on an Australian fresh-water herring. That the South American forms differ generically in several respects was adequately pointed out by Thompson (1916, p. 458), the chief differences consisting in the much more numerous gill rakers of the latter, the presence of a notch in its upper jaw, its wider maxillary, the absence of teeth, and in the position of the ventral fins, which are inserted under the base of the dorsal in *Ethmidium* instead of in advance of dorsal as in *Potamalosa.*

A single species is represented among the specimens from Peru now at hand, which differ somewhat from specimens from Chile, as pointed out subsequently.

ETHMIDIUM CHILCAE, new species

MACHETE

FIGURE 17

Clupea maculata GÜNTHER, 1868, p. 443, Chile, Peru (in part not of Cuvier and Valenciennes; description based on a Peruvian specimen).

Potamalosa notacanthoides ABBOTT, 1899, p. 333, Callao, Peru (not of Steindachner; note on type specimens of *Clupea notacanthus* Günther; description).—STARKS, 1906, p. 778, Callao, Peru (not of Steindachner).—EVERMANN and

Radcliffe, 1917, p. 19, Callao, Peru (not of Steindachner; description).—Nichols and Murphy, 1922, p. 504, Pisco Bay, near Isla Blanca, Peru (not of Steindachner).—Fowler, 1941a, p. 232 (not of Steindachner; references; fig. 7).

Ethmidium maculatum Fowler, 1940b, p. 745, fig. 9, Peru (not of Cuvier and Valenciennes); 1941a, p. 233 (references).

Head 3.0 to 3.1; depth 2.8 to 3.1; D. 18 to 20; A. 15 to 18; P. 16 to 18; scales 52 to 60; vertebrae 48 (one specimen dissected).

Body rather strongly compressed, its greatest thickness generally about equal to depth over middle of anal; caudal peduncle about as deep as long, 3.2 to 3.75 in head; head rather compressed, somewhat convex above, its greatest thickness equal to eye and snout in large examples, somewhat less in smaller ones; snout moderately blunt, 5.3 to 6.5 in head; eye 3.8 to 5.3, with adipose tissue somewhat developed in adults; mouth rather large, oblique; lower jaw slightly included; maxillary rather more than half width of eye, its lower margin for the most part nearly straight, broadly rounded posteriorly, extending opposite vertical from posterior margin of eye in large examples, scarcely to this point in small ones, 2.0 to 2.3 in head; mandible 1.75 to 1.85; gill rakers very numerous, equal to or somewhat longer than eye, 130 on lower limb of first arch in a specimen 270 mm. long; scales rather firm and adherent, strongly denticulate, generally with 2 definite vertical radii, often with 1 and sometimes 2 or 3 additional less distinct vertical radii; ventral scutes rather strong, 19 to 21 in advance of ventrals, and 16 to 18 behind them; 21 to 30 median scutes in advance of dorsal; dorsal more or less over middle of body, its origin fully an eye's diameter nearer tip of snout than base of caudal, distance anterior to its origin 1.95 to 2.1 in length, the fin somewhat elevated anteriorly, the last ray longer than the immediately preceding ones, its margin concave, the longest rays 1.6 to 1.85 in head; anal much lower, and smaller, last ray somewhat enlarged, its origin about three-fourths as far from base of caudal as from base of ventral, base

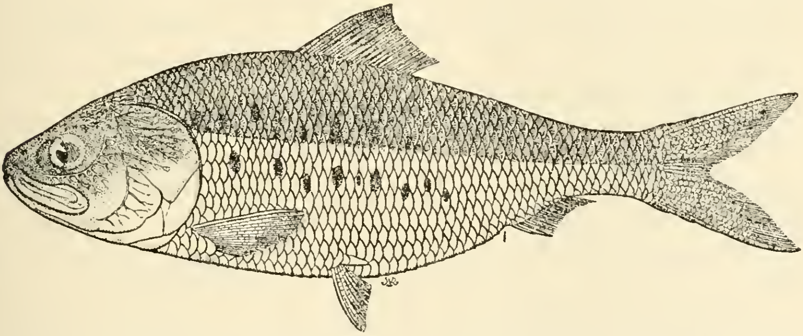

Figure 17.—*Ethmidium chilcae*, new species. From the type, 270 mm. long, Chilca Bay Peru (U.S.N.M. No. 127806).

of fin 2.55 to 3.1 in head; ventral inserted under base of about the sixth ray of dorsal, and approximately an eye's diameter nearer base of pectoral than origin of anal; pectoral moderately long and pointed, failing to reach base of ventral by rather less than diameter of eye in large examples, by less than pupil in smaller ones, inserted about equidistant from base of ventral and middle of eye, the fin 1.6 to 1.75 in head, 4.7 to 5.0 in length.

Color in alcohol bluish brown or bluish gray above, the color of back changing abruptly to silvery somewhat above middle of side; dorsal, caudal, and anal more or less dusky; other fins pale; sides with 2 parallel rows of vertically elongate dark spots; the upper series consisting of about 10 spots extending backward from upper posterior angle of opercle and situated in the lower part of the bluish color of the back; these spots indistinct in some specimens; the second row generally consisting of about 8 spots, beginning behind margin of opercle, and somewhat below middle of body; spots of second row much more prominent than those of upper row in large specimens, though missing in the smaller ones; a few large specimens with a third row consisting of 2 or 3 obscure spots; large specimens with indefinite dark lines along the rows of scales on back.

Twelve specimens, ranging in length from 125 to 270 mm., collected at Callao and in Chilca Bay, Peru, are at hand. A specimen 270 mm. long (212 mm. to base of caudal) (U.S.N.M. No. 127806), taken by the Mission at Chilca Bay, has been selected as the type. The following enumerations and proportions are based on this specimen: D. 18; A. 15; P. 16; scales 55; ventral scutes 19+18; dorsal scutes 26; gill rakers 131. Head in length 3.1; depth 2.9. Eye in head 5.6; snout 4.0; maxillary 2.1; mandible 1.85; interorbital 4.85; longest dorsal ray 1.85; anal base 2.95; and pectoral 1.75. In the type the upper row of black spots is rather obscure, the second row is very prominent, and dark lines along the rows of scales on the back are evident.

This species does not seem to be identifiable with *Alausa maculata* or *A. coerulea* both of Cuvier and Valenciennes (1847, pp. 430 and 432), which have been considered as belonging to the genus *Ethmidium* (or *Potamalosa*) by authors. Their generic relationship cannot be certainly determined, however, from the descriptions, which are quite inadequate and fail to mention dorsal scutes. Peruvian specimens, indeed, have been identified with *A. maculata* by authors, as shown by the synonymy given. These identifications probably were incorrect. That, at least, seems true of Fowler's identification (1940b, p. 745), whose specimens are now before me.

Clupea notacanthus Günther (1868, p. 443) also was based on specimens from Valparaiso, Chile. This species certainly belongs to *Ethmidium*, as dorsal scutes are mentioned in the original description.

However, that species is described as having nearly smooth scales, which is in general agreement with specimens from Lota, Chile, and in disagreement with Peruvian ones which have strongly denticulate scales.

There are now before me 25 specimens, ranging from about 85 to 145 mm. in total length (caudal fins damaged), 70 to 113 mm. to base of caudal, of the genus *Ethmidium* from Lota, Chile, collected by the *Albatross* (U.S.N.M. No. 77385). These have been compared with others of similar size and larger ones from Peru. There can be little doubt that the material from the two countries is specifically distinct, as the head in specimens from Chile is shorter (3.25 to 3.4); the depth is greater (2.75 to 2.9); the caudal peduncle is deeper (2.8 to 2.95 in head); the pectoral is shorter, failing to reach base of ventral by diameter of eye, only by diameter of pupil in Peruvian specimens of similar size (5.4 to 5.9 in length); and the ventral outline is much more strongly convex.

Peruvian material also has been identified with *Clupea notacanthoides* Steindachner (1869b, p. 20), from Mazatlán, Mexico, known to me only from the original description with figure. So far as may be judged from these, the Peruvian specimens at least are closely related to that species, which undoubtedly belongs to *Ethmidium* as herein understood. The Mazatlán fish apparently differs in having a smaller eye (6.33 in head), a longer snout (4.75 in head), broader interorbital (4.0 in head), lower dorsal (longest rays 2.25 in head), and probably a little shorter anal (14 rays). Dorsal scutes are given as 7, which may be a misprint for 27, and the pectoral is said to be contained 2.75 times in head, which according to the figure should have been stated as 1.75. The mandible is described as being bent upward, hooklike, at the tip. In Peruvian specimens it is nearly straight. The ventrals are said to be inserted exactly equidistant from tip of snout and base of caudal, whereas in Peruvian specimens they are midway between the anterior margin of the eye and base of caudal. It is also to be noted that only one row of dark spots, corresponding to the second row in Peruvian fishes, is described and figured in the Mexican fish. It seems correct, therefore, to assume that the Peruvian and Mexican fish too are different. The Peruvian specimens studied, therefore, seem to be without a name.

It is interesting that *E. notacanthoides* (Steindachner) apparently has not been taken by collectors since it was described, when only one specimen was available. No mention of this species is made in such general works as Jordan's "Fishes of Sinaloa" (1895) and Jordan, Evermann, and Clark's "Check List" (1930).

Range.—Coast of Peru; Chincha Island, Callao, and Pisco Bay.

Genus SARDINOPS Hubbs, 1929

Body elongate, moderately compressed; midline of abdomen not sharply compressed, with rather weak scutes; mouth moderately large; maxillary not extending beyond middle of eye; upper jaw without a definite notch on midline; teeth small or absent, none on vomer; opercle with rather strong radiating grooves and ridges; gill rakers numerous, those of upper limb extending forward and downward across the ones on lower limb; dermal flap on vertical part of shoulder girdle short and slightly 2-lobed; opercle deeply indented over dermal extension of shoulder girdle in advance of pectoral; scales regularly placed, with nearly vertical radii, about 50 in lateral series; vertebrae about 50; dorsal over middle of body, with about 16 to 20 rays; anal with about the same number of rays, the last two enlarged; ventral with 8 rays, inserted under base of dorsal.

A single species, closely related to the "California sardine," occurs in Peru.

Fowler (1941b, p. 620) synonymized *Sardinops* with *Arengus* Cornide without stating a reason. However, until data in support of the identity are produced, I shall recognize *Sardinops* essentially as defined by Hubbs (1929, p. 264).

SARDINOPS SAGAX (Jenyns)

SARDINA

Clupea sagax JENYNS, 1842, p. 134, San Lorenzo Island and Lima, Peru (original description).

Clupanadon fimbriata ABBOTT, 1899, pp. 332, 334, Callao, Peru (recorded from 6 specimens, notes, compared with *C. caeruleus*).

Clupanadon sagax ABBOTT, 1899, p. 334 (references).

Sardinella fimbriata STARKS, 1906, p. 778, Callao, Peru (notes).

Sardinella sagax EVERMANN and RADCLIFFE, 1917, p. 20, Callao and Lobos de Afuera, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 504, Chincha Islands, Peru.

Arengus sagax FOWLER, 1940b, p. 745, fig. 4, Callao, Peru; 1941a, p. 232 (references; range); 1941b, p. 622 (synonymy, several nominal species united; description; greatly extended range).

Head 3.3 to 3.7; depth 4.2 to 4.6; D. 17 to 20; A 17 to 19; P. 17 or 18; scales 52 to 60; vertebrae 50 to 52 (two specimens dissected).

Body only moderately compressed, its greatest thickness generally about equal to its depth at origin of anal; caudal peduncle short and rather slender, its depth 3.8 to 4.2 in head; head compressed, moderately flat above, its greatest thickness equal to snout and fully half the eye; snout blunt, 3.5 to 3.8 in head; eye 4.25 to 5.0; mouth moderate, oblique, nearly terminal, with slight notch in upper jaw; maxillary broad, its lower margin broadly convex, extending about to middle of eye, 2.25 to 2.5 in head; mandible 1.75 to 1.9; teeth wanting; gill rakers very long in adult, about as long as eye, increasing greatly in number with age, young 50 mm. long with about 40 on lower limb of first arch, adult 300 mm. long with about 100; scales thin, with finely crenulate margins, often partly lost in preserved specimens; ventral scutes rather weak, 18 to 20 in advance of ventrals, not definitely countable behind ventrals; dorsal over middle of body, its origin about equidistant from tip of snout and vertical from end of base of anal, rather variable, distance anterior to its origin 2.1 to 2.3 in length, fin somewhat elevated anteriorly, the longest rays generally reaching tip of last ray if deflexed, the first two divided rays generally the longest and of about equal length, 1.65 to 1.75 in head; anal quite low, its origin generally rather nearer base of caudal than base of ventral, the last two rays longer and stronger than the preceding ones, base of fin 2.0 to 2.4 in head; ventral inserted under middle of dorsal, and equidistant from base of pectoral and origin of anal or somewhat nearer the latter; pectoral moderately long, failing to reach ventral in adults by a distance generally about equal to length of snout, inserted nearer base of ventral (by about half diameter of eye) than tip of snout, the fin 1.6 to 1.7 in head.

Color of preserved specimens bluish above; sides silvery; the smaller specimens with a series of six to eight black spots extending from shoulder to or beyond vertical from base of ventral, these missing in large specimens which have small dark spots along the rows of scales, these spots more evident where scales are missing; dorsal and caudal more or less dusky, the former often with a black tip; pectorals dusky in very large examples only; other fins pale. Young under 60 mm. or so in length with a dark lateral band and no dark spots.

This species is represented by 11 adults, 145 to 325 mm. in length, and by many smaller ones, the least one being only 35 mm. long. The proportions and enumerations given are based on 11 specimens, 50 to 325 mm. long, which were collected in Sechura Bay, Lobos de Afuera Bay, Chimbote Bay, Samanco Bay, and at Callao, partly by the Mission, partly by R. E. Coker, and a few by the Wilkes Expedition. A small specimen (U.S.N.M. No. 101638), about 66 mm. long (caudal damaged), 54 mm. to base of caudal, from Albemarle Island, Galápagos, preserved by W. L. Schmitt, was compared with the Peruvian material, with which it seems to be identical. I am not aware of a previous record of the occurrence of this species in the Galápagos Islands. Two specimens, 160 and 170 mm. long, from "Chile" also were examined.

The Peruvian specimens have been compared with specimens from California, from which they are scarcely separable. Although Abbott (1899, p. 334) stated that the Peruvian specimens are "readily distinguishable from *C. caeruleus* by the greater number of fin rays and the numerous and more delicate striae on sides of head," I have failed to find these differences. If a difference in the number of fin rays exists it apparently is only an average one, as 3 specimens from California in which the rays were enumerated are all within the range of *S. sagax*, the dorsal having 18, 18, and 19 rays, the anal 17, 18, and 19, and the pectoral 18, 18, and 18. The numbers of scales, ventral scutes, and gill rakers, too, are within the range of the Peruvian specimens. The proportions derived from measurements also fall within the range of *S. sagax*. However, the pectoral fin does seem to be inserted rather more anteriorly in *caeruleus* than in *sagax*, as it is nearer the tip of lower jaw (sometimes by a distance as great as the diameter of the eye) than base of ventral in the former, whereas it is inserted nearer base of ventral (sometimes by a distance equal to half diameter of eye) than tip of lower jaw in the latter. This difference in the position of the pectoral is evident also from the greater distance between the tip of the pectoral and the base of the ventral in *caeruleus*, which generally is equal to the snout and half the eye, and only about equal to the snout in *sagax*. Furthermore, the ventral generally is inserted slightly behind middle of base of dorsal in *caeruleus*, instead of directly under the middle as in *sagax*. The positions of the fins, however, vary among specimens, and in large series some examples probably would not be identifiable by the apparent differences mentioned.

Range.—Coasts of Peru and Chile, and the Galápagos Islands. According to Fowler (1941b, p. 623), "Natal, Cape of Good Hope, China, Formosa, Japan, Korea. Also the eastern Pacific shores of America."

Genus HARENGULA Cuvier and Valenciennes, 1847

Body moderately compressed; ventral outline more strongly convex than the dorsal, with about 26 to 32 scutes; upper jaw slightly notched; lower jaw projecting; margin of opercle concave over a fleshy lobe on shoulder girdle in front of pectoral; shoulder girdle with 2 small fleshy lobes on its vertical margin; upper limbs of first pair of gill arches with a median forward projection between them, generally bearing one to several short rakers; gill rakers not especially numerous, about 30 on lower limb of first arch, those of upper limb not overlapping the ones on the lower limb; scales firm, adherent; vertebrae about 40 to 42; ventrals each with 8 rays, inserted somewhat behind origin of dorsal.

A single species somewhat doubtfully comes within the scope of the present work.

HARENGULA THRISSINA (Jordan and Gilbert)

Clupea thrissina JORDAN and GILBERT, 1882e, p. 353, Cape San Lucas, Mexico (original description).

Sardinella thrissina MEEK and HILDEBRAND, 1923, p. 185, pl. 9, fig. b, Taboga Island, Panama (synonymy; description; range).

Harengula peruana FOWLER and BEAN, 1923, p. 2, Callao, Peru (original description).—FOWLER, 1940b, p. 746, fig. 6 (reference); 1941a, p. 233 (references).

Head 3.5; depth 3.2; D. 18; A. 16; V. 8; P. 15; scales 40.

Body moderately compressed, its greatest thickness somewhat exceeding depth of caudal peduncle; ventral outline much more strongly convex than the dorsal; caudal peduncle rather deeper than long, 2.7 in head; head flat above; snout short, 4.5; eye 3.15; interorbital 5.1; mouth moderately small, oblique; lower jaw projecting, but not into dorsal outline; maxillary fully half width of eye, rounded distally, not quite reaching middle of eye, 2.15 in head; mandible very deep at side, 2.3 in head; teeth minute, present on premaxillaries laterally, on margin of maxillary far beyond the gape, on palatines, tongue, and pterygoids, but not on vomer; gill rakers slender, the longest ones about two-thirds length of eye, 30 on lower limb, and 13 on the upper one (exclusive of the small ones on the forward projection), of the first arch; ventral scutes fairly strong, about 15 (partly injured) before ventral fins and 14 behind them; scales firm, with indented membranous edges; dorsal fin injured, its origin rather nearer snout than middle of anal base; caudal injured; anal imperfect, low, its origin somewhat nearer base of caudal than base of ventral, its base 2.0 in head; ventral inserted a little behind vertical from origin of dorsal; pectoral imperfect, inserted about equidistant from tip of mandible and base of ventral.

Color grayish above; silvery on sides; indications of light streaks along rows of scales; no opercular spot.

The description is based on the type (U.S.N.M. No. 83156) of *H. peruana*, 92 mm. long to base of caudal, with injured fins. The length is given as 105 mm. in the original description, wherein the type locality shown is Callao, Peru, and the collector is the Wilkes Exploring Expedition. Recent collectors did not take this species, and Margaret Storey (1938, p. 51) questioned the correctness of the locality given. I am unable to read what I assume to be the original label with the specimen.

The type of *H. peruana* was compared with specimens of *H. thrissina* from Panama Bay, without detecting any significant differences. Fowler and Bean seem to have believed that the absence of an opercular spot was important. However, Meek and Hildebrand (1923, p. 186) pointed out that it was sometimes absent in Panama material. More recently collected specimens from Panama, now at hand, confirm the observation. The large number of gill rakers ("about 18+36") given in the original description apparently is an error, as I am able to count only 13+30, which brings the enumeration within the range of specimens from Panama Bay. The following proportions and enumerations are based on 11 specimens, 48 to 105 mm. (38 to 81 mm. to base of caudal) long, from Panama Bay: Head 3.4 to 3.8 in length; depth (increasing somewhat with age) 2.8 to 3.4; anal base 6.3 to 7.7; pectoral 4.6 to 5.0. Eye 2.9 to 3.5 in head; snout 4.3 to 4.8; interorbital 4.3 to 5.0; maxillary 2.1 to 2.2; mandible 1.9 to 2.2;

caudal peduncle 2.3 to 3.6; anal base 1.75 to 2.2; pectoral 1.25 to 1.4. D. 16 to 19; A. 15 to 17; V. 8; P. 14 or 15; scales 38 to 42; gill rakers 12 to 14+27 to 33; ventral scutes 16 or 17+12 to 14; vertebrae 41 or 42 (4 specimens dissected).

Range.—Gulf of California to Panama Bay and probably south to Peru.

Genus LILE Jordan and Evermann, 1896

Body much compressed, chest and abdomen carinate, with about 28 to 30 well-developed scutes; mouth small, nearly vertical; upper jaw with a slight notch; teeth minute, present on premaxillary, maxillary, mandible, and in a median series on tongue; gill rakers slender, much shorter on upper than on lower limb, about 30 to 35 on lower limb of first arch; scales rather firm, with vertical radii; vertebrae about 40 to 43; margin of opercle concave in advance of pectoral and over a slightly produced fleshy lobe on shoulder girdle; no fleshy lobe evident on the rim of the girdle above base of pectoral; ventral inserted about under origin of dorsal, with 8 rays; side with a bright silvery band.

A single species is known.

LILE STOLIFERA (Jordan and Gilbert)

Pelada

Clupea stolifera Jordan and Gilbert, 1882b, p. 339, Mazatlán, Mexico (original description).

Harengula stolifera Evermann and Radcliffe, 1917, p. 21, Capón, Peru (description, based on 2 large specimens).—Fowler, 1941a, p. 233, fig. 8 (references).

Head 4.1; depth 3.6; D. 18; A. 23; P. 15; V. 8; scales 44; vertebrae 44.

Body greatly compressed; ventral outline much more strongly convex than the dorsal; greatest thickness scarcely equal to depth of caudal peduncle; peduncle notably shorter than deep, 2.15 in head; head rather small, flat above, its outline nearly straight; snout shorter than eye, 4.3 in head; eye 3.5, with small amount of adipose tissue; interorbital 5.1; mouth small, strongly oblique, with tip of lower jaw moderately projecting; maxillary-premaxillary strongly curved, nowhere wider than pupil, scarcely reaching anterior margin of pupil, 2.55 in head; mandible 2.5; teeth minute, present on anterior part of mandible, on premaxillary and maxillary, none clearly evident elsewhere; gill rakers slender, scarcely longer than pupil, 18 very short ones on upper limb and 33 on lower limb of first arch; ventral scutes moderately strong, 17 in front of ventrals and 13 behind them; scales rather adherent, with vertical or wavy radii, and slightly rough edges, extending on caudal fin; dorsal injured, its origin fully half length of head nearer tip of snout than base of caudal; caudal moderately forked, not much longer than head; anal small, low, its base 5.3 in length; ventral about as long as snout and eye, inserted slightly behind vertical from origin of dorsal; and a little nearer base of pectoral than origin of anal; pectoral notably larger, failing to reach base of ventral by diameter of pupil 1.2 in head, 4.95 in length.

Color in alcohol pale brownish yellow; sides with a very prominent silvery lateral band, about three-fourths width of eye; median line of back with a dark streak; scales on side above lateral band with brownish edges; tips of caudal lobes black.

The single specimen from the Gulf of Guayaquil at hand forms the basis for the foregoing description. It is one of two specimens described by Evermann and Radcliffe (see reference above). This fish is 140 mm. (114 mm. to base of caudal) long and was secured at Capon by R. E. Coker. It has been compared with specimens from Tumaco, Colombia; from the Panama Canal and Panama Bay; and from Mazatlán, Mexico, the type locality. The specimen in hand has a somewhat greater number of vertebrae, gill rakers, and anal rays than the other specimens examined. It also has a rather slenderer body than the specimens from Mazatlán and Panama, but it is not so slender as the specimens from Tumaco, Colombia. The determination of the exact relationship of the representatives from different regions will have to await the collection of more specimens from the Gulf of Guayaquil. On the basis of the single specimen at hand it would seem that this southern fish is subspecifically distinct from the Panama ones.

Range.—Concepción Bay, Baja California, to Capón, Peru.

Genus ILISHA[4] Gray, 1845

Body much compressed; thorax and abdomen armed with strong scutes; upper jaw without notch; lower jaw strongly projecting; teeth minute, present on jaws, palatines, pterygoids, and tongue, none on vomer; gill rakers moderately long, not very close-set and not numerous, about 20 to 25 on lower limb of first arch; anal fin very long, with more than 35 rays; ventral fins small, inserted in advance of dorsal.

A single species is known from the Pacific coast of tropical America.

ILISHA FÜRTHII (Steindachner)

MACHETE

Pellona fürthii STEINDACHNER, 1874, p. 14, Panama Bay (original description).

Ilisha fürthii STARKS, 1906, p. 778, Guayaquil, Ecuador (recorded from 4 specimens).—MEEK and HILDEBRAND, 1923, p. 189 (synonymy; description; range).

Head 3.5 to 3.75; depth 2.75 to 3.3; D. 15 or 16; A. 46 to 50; P. 15; scales 59 to 61; vertebrae 52 (one specimen dissected).

Body very strongly compressed, especially ventrally; ventral outline much more strongly convex than the dorsal; greatest thickness scarcely exceeding depth of caudal peduncle; caudal peduncle somewhat deeper than long, its depth 3.0 to 3.5 in head; head greatly compressed, its dorsal outline slightly concave; snout scarcely as long as eye, 4.2 to 4.6 in head; eye large, 3.4 to 4.1; interorbital narrow, 11.0 to 12.0; mouth oblique, superior, the mandible strongly projecting; maxillary broad, about two-thirds width of eye, its lower margin convex, rounded posteriorly, scarcely reaching middle of eye, 2.1 to 2.25 in head; mandible 1.95 to 2.0; teeth all minute, in a single series in each jaw widely separated at midline, those on premaxillary widely separated from the ones on maxillary, in broad bands on palatines, pterygoids and tongue; gill rakers about two-thirds length of eye, well separated, 11 or 12 on upper and 21 to 25 on lower limb of first arch; scales thin, usually mostly lost in preserved specimens, with somewhat irregular margins; ventral scutes sharp, 23 or 24 in advance of ventral fins, and 11 to 14 behind them; dorsal more or less over middle of body, its origin about equidistant from tip of mandible and base of caudal; caudal rather deeply forked, the lower lobe longer than the upper; anal very long and low, its origin generally somewhat in advance of vertical from base of last ray of dorsal, its base 2.7 to 2.95 in length; ventral small about as long as eye, inserted about equidistant from base of pectoral and origin of anal; pectoral rather long, reaching well beyond base of ventral, 1.35 to 1.5 in head, 5.0 to 5.3 in length.

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[4] I am unable to follow Norman (1923) who placed the species herein described in his new genus *Neosieus*, which is said to have "a small toothed bone in place of the ligament (in *Ilisha*) between the distal end of the premaxillary and the middle of the maxillary." The specimens from the Gulf of Guayaquil and others from Panama Bay all seem to have a ligament instead of a toothed bone, and therefore the local species apparently should remain in *Ilisha*.

Color in alcohol bluish gray above; sides below level of upper posterior angle of opercle silvery; upper surface of snout and tip of mandible dusky; all fins, exclusive of the ventrals, with dusky points; tips of dorsal and pectoral quite dark.

This species is represented by a single specimen in the collection furnished by the Mission, which was taken in the Gulf of Guayaquil off Puerto Pizarro. This specimen; one from the mouth of the Tumbes River, Gulf of Guayaquil; three from the "West coast of South America," probably also from the Gulf of Guayaquil; and one from Guayaquil, Ecuador, form the basis for the foregoing description. These range in length from 180 to 330 mm. (142 to 270 mm. to base of caudal). They were compared with others from Panama Bay, the type locality, with which they seem to agree in all respects.

Range.—Panama Bay to the Gulf of Guayaquil in northern Peru.

Genus OPISTHOPTERUS Gill, 1861

Body elongate, very much compressed; chest and abdomen armed with strong sharp bony scutes; mandible projecting; maxillary ending somewhere under eye, not produced; teeth small, in a single series on premaxillary, maxillary, and mandible, and in bands on palatines, pterygoids, and tongue, none on vomer; dorsal fin small, placed behind middle of body; anal very long, with about 50 to 60 rays; ventrals missing; pectorals rather large, often equal to or longer than the head.

A single species, which seems to be new, occurs in the collections from Peru that are at hand for study.

OPISTHOPTERUS EQUATORIALIS, new species

FIGURE 18

Head 5.3 to 5.8; depth 3.4 to 3.55; D. 11 or 12; A. 59 to 62; P. 12; scales mostly lost, about 50; vertebrae 47 (one specimen dissected).

Body very strongly compressed, ventral outline much more strongly convex than the dorsal; greatest thickness scarcely exceeding diameter of eye; caudal peduncle much shorter than deep, 2.45 to 2.6 in head; head very small, its dorsal outline straight and horizontal, and much lower than nape; snout shorter than eye, 5.2 to 6.0 in head; eye 3.15 to 3.4; interorbital 9.0 to 11.0; mouth superior, nearly vertical; maxillary about as wide as pupil, extending only slightly beyond anterior margin of eye, 2.5 to 2.85 in head; mandible 2.45 to 2.6; teeth all minute; gill rakers about as long as pupil, 10 on upper and 25 on lower limb of first arch; scales thin, nearly all lost, with somewhat irregular margins; ventral scutes sharp, 26 to 28; dorsal rather weakly developed, far behind middle of body, about over middle of anal base, its origin about half as far from base of caudal as from tip of mandible; caudal fin (injured) broadly forked, apparently shorter than head; anal very long and low, its origin about an eye's diameter nearer tip of mandible than base of caudal, its base 1.85 to 1.95 in length; pectoral large, exceeding length of head, 4.5 to 4.8 in length.

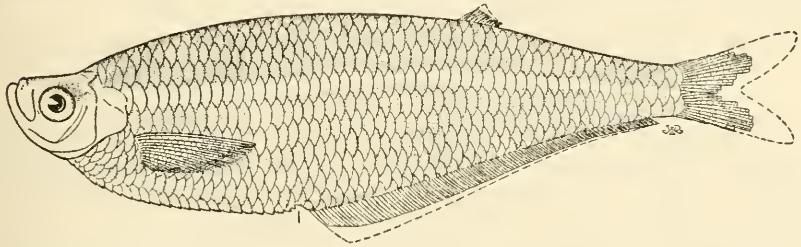

FIGURE 18.—*Opisthopterus equatorialis*, new species. From the type, 160 mm. long, Puerto Pizarro, Peru (U.S.N.M. No. 127807).

Color of preserved specimens plain; sides of head silvery; a distinct silvery band, about the width of pupil extending from upper angle of opercle to base of caudal; upper parts of head and back with dusky dots, forming a more or less definite dark band on midline of at least most of length; fins all with dusky points.

This species is represented in the Peruvian collection made by the mission by 6 specimens, about 155 to 165 mm. (caudal fins injured) in total length (130 to 138 mm. to base of caudal), all caught in an otter trawl in the Gulf of Guayaquil, off Puerto Pizarro. A specimen

(U.S.N.M. No. 127807) about 160 mm. (136 mm. to base of caudal) long, though imperfect in that most of the fins have been more or less injured, and the scales are mostly missing, has been selected as type. The following enumerations and proportions are based on this specimen: D. 12; A. 60; P. 12; scales about 50; ventral scutes 26; gill rakers 8+24. Head in length 5.4; depth 3.4; anal base 1.9; pectoral 5.0. Eye in head 3.3; snout 5.3; maxillary 2.8; mandible 2.5.

O. equatorialis differs widely from *O. dovii* (Günther) in the notably smaller head, much more oblique mouth, smaller teeth, more numerous gill rakers, in the presence of a narrow silvery lateral band, and in a number of other respects. In *O. dovii* the head is contained 4.3 to 5.15 in the length; maxillary 1.95 to 2.2 in head; mandible 1.8 to 2.0; gill rakers 7 to 9+15 or 16. *O. equatorialis* probably is rather nearer to *O. macrops* (Günther), which I have not seen. However, the body seems to be deeper in *equatorialis*, the head smaller, eye smaller, and the dark humeral spot is absent, whereas a narrow silvery lateral band is present. According to the description by Gilbert and Starks (1904, p. 41) the depth of the body in *O. macrops* is contained 2⅚ to 3 in the length; head 4⅗ to 4⅔; eye 2⅔ to 2¾ in the head.

Range.—Known only from the Gulf of Guayaquil off northern Peru.

Genus ODONTOGNATHUS Lacepède, 1800

This genus differs from *Opisthopterus* principally in the produced maxillary in the adult, which becomes narrow posteriorly and reaches the gill opening. However, even in small specimens the maxillary is longer and distally narrower than in *Opisthopterus*. The teeth in the maxillary are definitely larger and more prominent, with the roots visible in the thin bone.

ODONTOGNATHUS TROPICUS, new species

Figure 19

Head 4.4; depth 3.65; D. 15; A. 48; P. 14; scales lost, about 48.

Body strongly compressed; dorsal outline from snout to dorsal only slightly convex, ventral outline anteriorly strongly convex, very slightly concave under pectoral fin, then gently convex; greatest thickness scarcely equal to depth of caudal peduncle; peduncle much shorter than deep, 2.5 in head; head moderately large, its dorsal outline continuous with general outline of back; snout shorter than eye, 3.8 in head; eye 3.1; interorbital 7.5; mouth slightly superior, very strongly oblique; maxillary with strongly convex margin, extending about under middle of eye (the specimen presumably being too young to have this bone prominently produced), 1.5 in head; mandible 1.5; teeth in jaws fairly prominent, very numerous, especially those in maxillary, with roots visible in the thin bone; gill rakers at angle about as long as pupil, those on upper limb very short, 8 on upper limb and 20 on lower limb of first arch; ventral scutes 26, very strong, with entire margins; dorsal injured, its origin about an eye's diameter behind origin of anal, and a little nearer base of caudal than posterior margin of eye; caudal fin missing; anal moderately long, its origin about equidistant from anterior margin of eye and base of caudal, its base 2.25 in length; pectoral injured, inserted about an eye's diameter nearer tip of mandible than origin of anal.

Color in alcohol plain grayish above, sides of head and of chest and abdomen silvery; tip of mandible and of snout, and back with dusky points; occiput with a pair of elongate dark spots.

The foregoing description is based on a specimen with injured fins, having a length of 66 mm. to the base of the caudal, which must serve as the type (U.S.N.M. No. 127809). It was taken by the Mission in an otter trawl in the Gulf of Guayaquil, off Puerto Pizarro. Two very small specimens, each about 38 mm. long, taken in a dredge in Sechura Bay, apparently also are of this species. Besides the Peruvian material I have examined rather numerous small specimens, 27 to 77 mm. (20 to 61 mm. to base of caudal) in length, from Panama Bay, which evidently also are of this species. The young are slender and do not have the concavity underneath the pectoral in the ventral outline, which generally becomes evident at a length, without the caudal fin, of about 60 mm., and of course the maxillary is not produced. The following enumerations and proportions are based on six or more specimens from Panama, ranging in length from 52 to 75 mm. (43 to 61 mm. to base of caudal): D. 14 to 16; A. 43 to 47; P. 14 or 15; ventral scutes 26 to 28; gill rakers 8 to 10+18 to 21; vertebrae 46 (one specimen dissected). Head 4.2 4o 4.5 in length; depth 4.2 to 4.6; anal base 2.45 to 2.7. Eye 3.2 to 3.85 in head; snout 4.1 to 4.75; maxillary 1.5 to 1.8; mandible 1.5 to 1.75; caudal peduncle 2.55 to 2.75; pectoral 1.55 to 1.65.

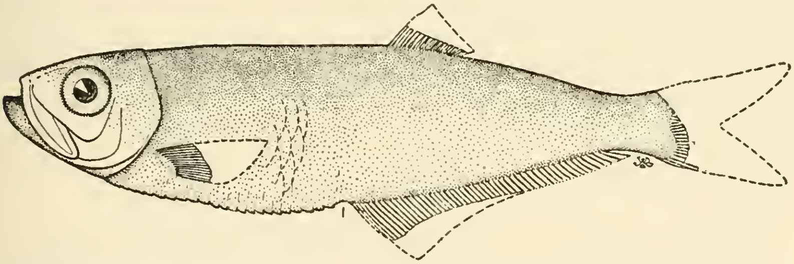

FIGURE 19.—*Odontognathus tropicus*, new species. From the type, 66 mm. long to base of caudal, Puerto Pizarro, Peru (U.S.N.M. No. 127809).

This species differs from *O. panamensis* (Steindachner), the only other species of the genus known from the Pacific coast of America, in the notably shorter anal; the more anterior position of the dorsal, which has more rays; and in the larger head and longer mandible. In *O. panamensis*, of which a single specimen, 125 mm. in total length, is available for comparison, the anal has 68 rays, and its base is contained 1.65 times in the length to base of caudal; the dorsal has only 11 rays and is situated over middle of anal; 31 ventral scutes are present, the posterior ones with serrate margins; head 5.4 in length; mandible 2.25 in head.

Range.—Northern Peru to Panama.

Family ENGRAULIDAE: Anchovies

Body elongate, variable in depth, more or less compressed; chest and abdomen compressed, often with a rather sharp edge, but not serrate in American species; snout pointed, piglike, generally projecting far beyond tip of mandible; eye generally in anterior half of head; mouth very large, usually horizontal; premaxillaries not protractile; maxillary long, slender, usually reaching far beyond posterior rim of eye; teeth typically minute, somewhat enlarged and uneven in the jaws in some genera, present also on vomer, palatines, pterygoids, and hyoids; gill membranes generally separate, connected by a membrane in *Cetengraulis;* branchiostegals slender, rather numerous; pseudobranchiae present; gill rakers typically rather long and slender, often numerous, denticulate; no lateral line; scales thin, usually lost in preserved material, with smooth or indented membranous borders; an enlarged scale present in axil of pectoral and ventral; dorsal fin single, more or less over middle of body; caudal forked; anal usually longer than dorsal.

Three genera come within the scope of the present work.[4a]

KEY TO THE GENERA

a. Gill covers separate, not connected by a membrane; body moderately to quite elongate, the depth usually being contained 4 or more times in the length.

  b. Body thick, not greatly compressed; anal fin small, with 20 to 24 rays, its origin far behind base of dorsal (in Peruvian species); gill rakers numerous, about 26 to 48 on lower limb of first arch; vertebrae about 46 to 49 (in Peruvian species) ---------------------------------- **Engraulis** (p. 97)

  bb. Body thinner, more strongly compressed; origin of anal generally under base of dorsal, occasionally slightly behind it; gill rakers generally fewer than 30 on lower limb of first arch; vertebrae about 40 to 42 (in Peruvian species) -- **Anchoa** (p. 98)

aa. Gill covers broadly united by a thin membrane across isthmus, easily torn, narrow in young; gill rakers long, slender, increasing from about 25 in small specimens to 60 or more in large ones on lower limb of first arch; body deep in adults, about 3.3 to 3.6 in length----------- **Cetengraulis** (p. 104)

[4a] In the Academy of Natural Sciences of Philadelphia there is a specimen labeled "*Engraulis tapirulus* Cope," doubtfully from Pacasmayo Bay, Peru. This specimen, as stated by me (1943a, p. 147), probably is *Lycengraulis poeyi.* I hesitate to list this species as definitely belonging to the Peruvian fauna, because of the doubtful place of collection of the specimen mentioned, and because recent collectors have not found it in Peru. If taken it may be recognized from the enlarged teeth, especially those in the lower jaw, wherein the species of *Lycengraulis* differ from all other anchovies.

Genus ENGRAULIS Cuvier, 1817

Body comparatively thick, subcylindrical; maxillary sometimes failing to reach joint of mandible, never to gill opening; jaws with small teeth of about even size; gill rakers numerous, 26 or more on lower limb of first arch, apparently not increasing in number with age; vertebrae numerous, 46 to 49; the bones generally feeble; the flesh dark and oily; anal fin short in American species, with 20 to 24 rays, its origin under or behind base of dorsal; ventrals inserted under or a little in advance of origin of dorsal.

A single species comes within the scope of the present work.

ENGRAULIS RINGENS Jenyns

ANCHOVETA

FIGURE 20

Engraulis ringens JENYNS, 1842, p. 136, "Iquique, Peru" (original description).—ABBOTT, 1899, p. 336 (a single specimen reported, without locality, compared with *E. mordax*).—EVERMANN and RADCLIFFE, 1917, p. 23, pl. 3, fig. 1, Chimbote, Lobos de Tierra, and Eten, Peru (note on abundance; description).—NICHOLS and MURPHY, 1922, p. 505, Pescadores Island, Peru (notes on abundance; schools described; preyed upon by bonitos and lobos (sea-lions)).—JORDAN and SEALE, 1926, p. 390, Callao, Peru, and Panama Bay, the latter not this species but *Anchoa arenicola* (description; compared with *E. mordax*).—FOWLER, 1941a, p. 235 (references).—HILDEBRAND, 1943a, p. 16, fig. 3 (synonymy; description; compared with *E. mordax mordax;* range).

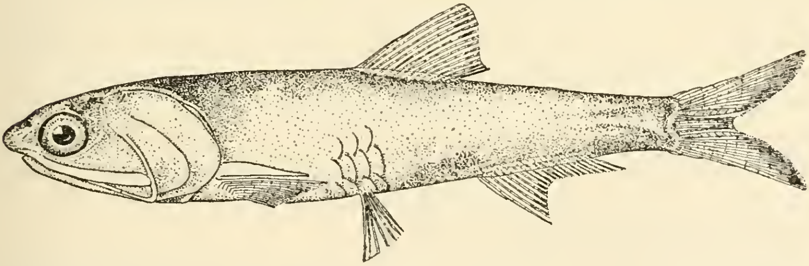

FIGURE 20.—*Engraulis ringens* Jenyns. From a specimen 115 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77522). (After Hildebrand, 1943.)

Head 3.0 to 3.7; depth 4.4 to 5.3 in large specimens, about 5.5 to 6.5 in young under 90 mm. long; D. 15 to 18; A. 19 to 24; P. 15 to 18, usually 16 or 17; scales about 43 to 47; vertebrae 46 to 49 (seven specimens dissected).

Body elongate, not strongly compressed, chest and abdomen moderately compressed, with a blunt edge; head rather long and low, its depth at joint of mandible a little less than its postorbital length; snout projecting about half its length beyond tip of mandible, 6.7 to 8.0 in head; eye 4.3 to 4.8; postorbital part of head 5.0 to 6.0 in length; maxillary distally rather bluntly rounded, generally failing to reach joint of mandible, 1.45 to 1.6 in head; mandible 1.45 to 1.55; cheek moderately long and narrow, about as long as snout and eye in large specimens, shorter in young; gill rakers long, slender, about as long as eye, difficult to enumerate, apparently not increasing in number with age, about 38 to 48 on lower limb and 35 to 43 on upper limb of first arch; dorsal fin with a nearly straight margin, the longest rays usually failing to reach tip of last one if deflexed, its origin equidistant from base of caudal and some point over anterior half of eye; anal rather small, origin about under tips of last rays of dorsal, its base 5.4 to 6.2 in length; ventral inserted a little in advance of origin of dorsal, reaching about halfway to anal, pectoral failing to reach ventral, 1.9 to 2.2 in head, 6.0 to 7.4 in length; axillary scale of pectoral long and slender, often failing to reach tip of fin by a distance equal to diameter of pupil, 2.3 to 3.0 in head.

Color bluish black above; sides of head and lower two-thirds of side silvery; young under about 80 mm. with a silvery lateral band; caudal largely black; other fins pale.

More than a hundred specimens, 85 to 140 mm. long, caught in a purse seine at night off Cañete by the Mission, are at hand. Specimens collected by R. E. Coker at Chimbote and Lobos de Tierra also were examined. The proportions and enumerations are based on 33 specimens, unless otherwise stated, ranging in length from 55 to 150 mm.

Immense schools of "anchovetas," apparently consisting chiefly of *E. ringens*, preyed upon by larger fishes, sea-lions, and birds, have been described by R. E. Coker (1910, p. 338), by R. C. Murphy (in Nichols and Murphy, 1922, p. 505), and by the Mission (1943, pp. 249–268). The publications by R. E. Coker and by the Mission contain statements and estimates of the great commercial importance of the "anchovetas," especially as food for the tremendously great flocks of birds occurring on the coast of Peru, which provide the product for the important guano industry of Peru.

Range.—Coasts of Peru and Chile, at least as far south as Lota.

Genus ANCHOA Jordan and Evermann, 1927

Body generally quite elongate, moderately to strongly compressed; maxillary long, extending to or more usually beyond joint of mandible, always more or less pointed; gill rakers not numerous, usually fewer than 30 on lower limb of first arch, not increasing with age; vertebrae about 38 to 44, rarely 45 or 46; origin of anal usually somewhere under base of dorsal, occasionally behind it.

KEY TO THE SPECIES

a. Anal fin long, with about 32 to 36 rays, its origin under or only a little behind that of dorsal ---------------------------------- **panamensis** (p. 99)

aa. Anal shorter, with about 20 to 27 rays, its origin usually under posterior half of base of dorsal.

b. Head short, 4.2 to 4.4 in length, its postorbital part especially short, 9.0 to 9.5 in length; eye large, 3.05 to 3.33 in head; pectoral with 11 or 12 rays, occasionally 13; origin of anal about under middle of base of dorsal. **curta** (p. 100)

bb. Head longer, 3.1 to 3.9 in length, its postorbital part longer, 5.7 to 6.3 in length; eye smaller, 3.7 to 4.7 in head; pectoral with 13 to 15 rays; origin of anal behind middle of base of dorsal.

c. Head long and low, its depth at joint of mandible about equal to its postorbital length; snout very long, piglike, projecting nearly its whole length beyond tip of mandible, fully as long as eye in adults; origin of anal well in advance of vertical from base of last ray of dorsal. **naso** (p. 101)

cc. Head deeper, its depth at joint of mandible equal to its postorbital length and about half the eye; snout shorter, projecting about three-fourths its length beyond mandible, notably shorter than eye except in very large specimens; origin of anal generally under or behind base of last ray of dorsal -- **nasus** (p. 103)

ANCHOA PANAMENSIS (Steindachner)

Engraulis panamensis Steindachner, 1875b, p. 39, Panama Bay (original description).

Stolephorus mundeolus Gilbert and Pierson, *in* Jordan and Evermann, 1898, p. 2812, Panama Bay (original description; compared with *S. panamensis* and *S. compressus*).

Anchovia panamensis Meek and Hildebrand, 1923, p. 207, pl. 15, fig. 1, Panama Bay (synonymy; description; relationship with *A. compressa* discussed).

Anchovia mundeola Meek and Hildebrand, 1923, p. 208, pl. 15, fig. 2, Panama Bay (synonymy; description; relationship with *A. panamensis* discussed).

Anchoa panamensis Hildebrand, 1943a, p. 42, fig. 13 (synonymy; description; reasons for synonymizing *A. mundeola* stated; range).

Head 4.1; depth 4.3; D. 12; A. 32; P. 12; scales about 41.

Body deep, strongly compressed, its greatest thickness notably less than depth of caudal peduncle; ventral outline much more strongly convex than the dorsal; chest and abdomen with a rather sharp edge; head short, its depth at joint of mandible not quite equal to length of head without snout; snout rather short, projecting about two-thirds its length beyond tip of mandible, 6.5 in head; eye 3.25; postorbital part of head 8.0 in length; maxillary rather pointed, reaching margin of opercle (rather variable in shape and length in Panama specimens), 1.2 in head; mandible 1.85 in head; cheek short and broad, only a little longer than eye; gill rakers scarcely two-thirds length of eye, 20 on lower limb and 16 on the upper one of first arch; scales lost; dorsal fin rather high anteriorly, the longest rays reaching far beyond tip of last one if deflexed, origin of fin about equidistant from base of caudal and middle of eye; anal long, its origin slightly behind that of dorsal, its base 2.75 in length; ventral reaching a little more than halfway to origin of anal, inserted slightly nearer origin of anal than base of pectoral; pectoral rather large, reaching a little beyond base of ventral, 1.3 in head, 5.35 in length; axillary scale of pectoral about half length of fin (variable in Panama specimens), 2.6 in head.

Color pale; side with a silvery band about as wide as pupil; side of head bright silvery; back with dark points, forming an indefinite stripe behind dorsal fin; dorsal and especially the caudal with dusky points; other fins pale.

A single specimen, 98 mm. (80 mm. to base of caudal) in length, was secured by the Mission. This fish, which was dredged in shallow water in the Gulf of Guayaquil, off Puerto Pizarro, Peru, forms the basis for the foregoing description. It was compared with specimens from Panama Bay, the type locality, with which it agrees quite well. The body increases considerably in depth with age, but the gill rakers apparently do not increase in number. In eight specimens from Panama the range of vertebrae was 41 to 43.

Range.—Mazatlán, Mexico, to Puerto Pizarro, on the Gulf of Guayaquil, Peru. The specimen from the Gulf of Guayaquil now before me is the only one known from south of the Río Dagua, Colombia.

ANCHOA CURTA (Jordan and Gilbert)

Stolephorus curtus JORDAN and GILBERT, 1882b, p. 343, Mazatlán, Mexico (original description).

Anchovia curta MEEK and HILDEBRAND, 1923, p. 206, Panama (synonymy; description; range).

Anchoviella curta JORDAN and SEALE, 1926, p. 407 (description, based on "cotypes").

Anchoa curta HILDEBRAND, 1943a, p. 85, fig. 36 (synonymy; description; compared with *A. parva;* range).

Head 4.2 to 4.4; depth 4.4 to 4.8; D. 15; A. 22 to 25; P. 11 or 12; scales lost, about 45; vertebrae 40 or 41 (two specimens dissected).

Body moderately deep, strongly compressed, its greatest thickness about equal to depth of caudal peduncle; ventral outline more strongly convex than the dorsal; chest and abdomen with a rather sharp edge; head short, its depth at joint of mandible almost equal to its length without snout; snout short, rather blunt, projecting about half its length beyond tip of mandible, 5.2 to 5.8 in head; eye 3.05 to 3.33; postorbital part of head 9.0 to 9.5 in length; maxillary pointed, extending slightly beyond joint of mandible, 1.25 to 1.35 in head; mandible 1.45 to 1.5; cheek short and very broad, scarcely as long as eye; gill rakers about three-fourths length of eye, 23 to 25 on lower and 16 to 19 on upper limb of first arch; dorsal fin with slightly concave margin, the longest rays reaching tip of last one if deflexed, origin of fin about equidistant from base of caudal and middle of eye; anal moderately long, its origin about under middle of base of dorsal, base of fin 4.0 to 4.3 in length; ventral reaching fully halfway to anal, inserted about equidistant from base of pectoral and origin of anal; pectoral rather small, failing to reach ventral by rather more than diameter of pupil, 1.4 to 1.5 in head, 6.0 to 6.5 in length; axillary scale of pectoral about three-fourths length of fin, 2.0 to 2.3 in head.

Color pale; side with silvery stripe, generally rather narrower than eye; side of head silvery; back with few dark dots at least behind dorsal fin; these also present along base of anal and in a median row behind anal; caudal fin with dark points, the tips dusky; other fins pale.

Eighty-nine specimens about 48 to 60 mm. (37 to 47 mm. to base of caudal) long, were secured by the Mission in the Gulf of Guayaquil, off Puerto Pizarro, Peru. These specimens were compared with others from Panama Bay, with which they agree. They formed the basis for the first record of the species from as far south as the Gulf of Guayaquil (Hildebrand, 1943a, p. 85).

Range.—Gulf of California (Río Yaqui) to Gulf of Guayaquil (Puerto Pizarro, Peru).

ANCHOA NASO (Gilbert and Pierson)

ANCHOVETA

FIGURE 21

Stolephorus naso GILBERT and PIERSON, *in* Jordan and Evermann, 1898, p. 2813, Panama Bay (original description; compared with *S. starksi*).

Anchovia naso GILBERT and STARKS, 1904, p. 43, Panama Bay (description; compared with *S. starksi*).—MEEK and HILDEBRAND, 1923, p. 201, Panama Bay (synonymy; description).

Anchoa naso HILDEBRAND, 1943a, p. 100, fig. 43, Panama Bay, Gulf of Guayaquil, Santa Island, and Cabo Blanco, Peru (synonymy; description; range).

Head 3.15 to 3.35; depth 4.1 to 5.25; D. 14 to 16; A. 24 to 27; P. 13 to 15; scales about 40 to 43; vertebrae 40 to 42 (eight specimens dissected).

Body quite elongate, rather strongly compressed, greatest thickness about equal to depth of caudal peduncle; ventral outline somewhat more convex than the dorsal; chest and abdomen with a narrow edge; head long and low, its depth at joint of mandible generally slightly greater than its postorbital length; snout very long, projecting nearly its whole length beyond tip of mandible, 4.8 to 5.7 in head; eye 3.8 to 4.7; postorbital part of head 5.75 to 6.3 in length; maxillary moderately pointed, extending to or slightly beyond joint of mandible, 1.25 to 1.45 in head; mandible 1.45 to 1.6; cheek long, narrow, equal to or longer than snout in large examples, shorter in young; gill rakers rather shorter than snout, 23 to 27 on lower, and 21 or 22, rarely 23 or 24, on upper limb of first arch; scales mostly lost, with rather even edges; dorsal fin with concave margin, the longest rays failing to reach tip of last one if deflexed, origin of fin equidistant from base of caudal and some point over anterior half of eye; anal moderately long and low, its origin under posterior half of base of dorsal but well in advance of base of last ray, base 3.8 to 4.3 in length; ventral reaching somewhat more than halfway to origin of anal, generally inserted rather nearer base of pectoral than origin of anal; pectoral rather large, sometimes reaching base of ventral, sometimes falling short of this point by diameter of pupil, 1.65 to 2.0 in head, 5.6 to 6.3 in length; axillary scale of pectoral about two-thirds length of fin, 3.0 to 3.3 in head.

Color of preserved specimens pale; side of head and lower half of body more or less silvery; side with a silvery band about as wide as eye sometimes missing or dark in specimens preserved in formalin; back with dusky points, not dense enough to form a dark band; caudal and dorsal with dusky points, other fins pale; the smaller specimens with dark dots along base of anal, and extending on caudal peduncle.

This species is represented in the collection made by the Mission in 1941 by 30 specimens, 48 to 135 mm. long, which formed the basis for the first record of this species from Peru (Hildebrand, 1943a, p. 100), as well as for the foregoing description. The specimens were collected in the Gulf of Guayaquil, off Puerto Pizarro; Cabo Blanco; Lobos de Tierra; Santa Island, near Chimbote; and in Sechura Bay. The specimens, in part, were removed from the stomach of a shark and a large scombroid fish.

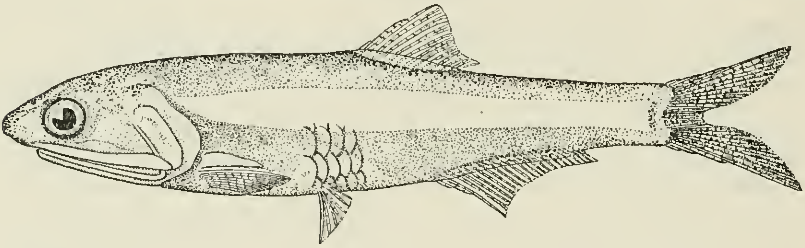

Figure 21.—*Anchoa naso* (Gilbert and Pierson). From a specimen 70 mm. long, Taboga Island, Panama (U.S.N.M. No. 79570). (After Hildebrand, 1943.)

Peruvian specimens of this species have rather more numerous anal rays and gill rakers than those from farther north, which makes it difficult to distinguish this species from *A. nasus* on the basis of these enumerations. However, the head is rather longer in *A. naso*, its length in standard length averaging 3.25 in 14 specimens, whereas in 13 specimens of *nasus* the average is 3.43. The anal base is somewhat longer, averaging 4.09 in the standard length in *naso* in the same group of specimens, and 4.36 in *nasus*. The species are readily recognizable if specimens of equal size are compared. For example, in species about 70 mm. long the snout in *naso* is much longer and more piglike, being fully as long as the eye, whereas, in *nasus* it is only about three-fourths as long as the eye; the cheek is much longer and narrower in *naso,* being about as long as the eye and half the snout, whereas it is only about as long as the eye in *nasus;* and finally specimens of *nasus* of this size have a rather definite dark stripe on the back, which *naso* lacks.

Range.—Panama Bay to northern Peru.

ANCHOA NASUS (Kner and Steindachner)

ANCHOVETA

FIGURE 22

Engraulis nasus KNER and STEINDACHNER, 1866, p. 388, pl. 2, fig. 17, Chincha Island, Peru (original description).

Engraulis tapirulus COPE, 1877, p. 29, probably Pacasmayo Bay, Peru (original description).

Engraulis peruanus STEINDACHNER, 1879a, p. 60, Callao, Peru (original description).

Stolephorus tapirulus ABBOTT, 1899, p. 335, "Pacasmayo bay?," Peru (description, based on type material).

Anchoviella peruana JORDAN and SEALE, 1926, p. 401 (description, based on specimens from Callao, Peru).

Engraulis nasus FOWLER, 1941a, p. 235 (references).

Anchoviella tapirulus FOWLER, 1941a, p. 235 (references).

Anchoa nasus HILDEBRAND, 1943a, p. 102, fig. 44, Gulf of Guayaquil, Callao, and Chincha Islands, Peru (synonymy; description; range).

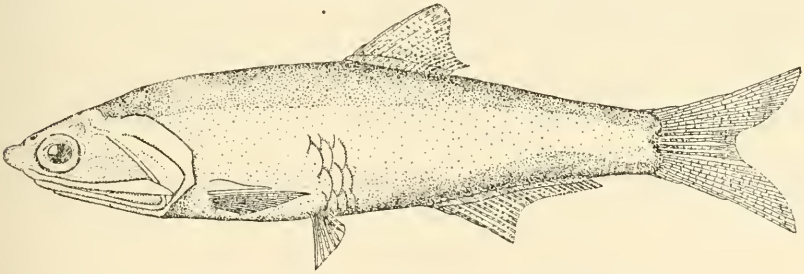

FIGURE 22.—*Anchoa nasus* (Kner and Steindachner). From a specimen 105 mm. long, "Peru" (M.C.Z. No. 17983). (After Hildebrand, 1943.)

Head 3.3 to 3.9; depth 3.9 to 4.6; D. 15 or 16; A. 21 to 27; P. 13 to 15; scales about 36 to 40; vertebrae 41 (2 specimens dissected).

Body rather slender, somewhat variable in depth, its ventral outline generally more strongly curved than the dorsal; chest and abdomen with a blunt edge; head moderately long and low, its depth at joint of mandible generally about equal to its postorbital length and half the eye; snout projecting about three-fourths its length beyond tip of mandible, 5.0 to 5.7 in head; eye 3.7 to 4.6; postorbital part of head 5.5 to 7.5 in length; maxillary rather pointed, extending slightly beyond joint of mandible, 1.2 to 1.3 in head; mandible 1.45 to 1.55; cheek moderately long and narrow, nearly as long as eye and snout in large specimens, notably shorter in young; gill rakers fairly slender, about as long as snout, 24 to 28 on lower and 21 to 25 on upper limb of first arch; scales mostly lost, with fairly smooth edges, and vertical striae; dorsal fin with a rather deeply concave margin, the longest rays nearly or quite reaching tip of last ray if deflexed, origin of fin usually nearer base of caudal than tip of snout, rather variable; anal moderately small, its origin variable, sometimes just behind base of last ray of dorsal, more usually under posterior rays of dorsal, its base 4.2 to 4.6 in length; ventral reaching fully halfway to origin of anal, inserted about equidistant from base of pectoral and origin of anal; pectoral rather variable in length, sometimes reaching base of ventral, more usually falling short of this point, 1.6 to 1.9 in head, 5.3 to 6.3 in length; axillary scale broad at base, about two-thirds length of fin, 2.5 to 3.4 in head.

Color of preserved specimens, silvery where scales remain; sides of head bright silvery; side with a bright silvery band, becoming indefinite in specimens about 115 mm. long, and disappearing in large examples; back with dusky punctulations, forming a dark median band in the smaller specimens; dorsal and caudal with dark points, the caudal often with dark tips and margin; other fins pale; the smaller specimens with dark dots along base of anal.

The collection made by the Mission contains 14 small specimens from the Gulf of Guayaquil off Puerto Pizarro, taken with a dredge. Twelve specimens from other collections, all from Callao, have also been used in preparing the foregoing description, which is based on specimens 48 to 140 mm. long.

This species is close to *A. naso*, as shown in the account of the last-mentioned species.

Range.—Gulf of Guayaquil, off Puerto Pizarro to Chincha Island, Peru.

Genus CETENGRAULIS Günther, 1868

Body deep in adults, strongly compressed; maxillary short, rounded distally, reaching near joint of mandible; teeth minute; gill rakers long, slender, increasing greatly in number with age; gill covers connected across the isthmus by a thin transparent membrane, easily torn, much narrower in the young than in adults; ventral fin inserted under or a little in advance of origin of dorsal; a silvery lateral band present in the young.

A single species comes within the scope of the present work.

CETENGRAULIS MYSTICETUS (Günther)

Engraulis mysticetus Günther, 1866, p. 604, Panama Bay (original description).

Stolephorus opercularis Jordan and Gilbert, 1882a, p. 275, Punta San Felipe, Gulf of California (original description).

Cetengraulis engymen Gilbert and Pierson, *in* Jordan and Evermann, 1898, p. 2815, Panama Bay (original description, based on young).

Cetengraulis mysticetus Meek and Hildebrand, 1923, p. 212, Panama Bay (synonymy; description; range).—Hildebrand, 1943a, p. 157, fig. 72 (synonymy; description; compared with *C. edentulus;* range).

Head 2.5 to 3.1; depth 3.3 to 4.3; D. 14 to 16; A. 21 to 24; P. 15; scales 42 to 45; vertebrae 41 or 42 (three specimens dissected).

Body strongly compressed, rather deep, increasing proportionately with age, its greatest thickness exceeding depth of the slender caudal peduncle, ventral outline much more strongly convex than the dorsal; head long, especially posterior to eye, increasing with age, its depth at joint of mandible about equal to postorbital part of head in very young, much shorter than that part of head in large specimens; snout notably shorter than eye, 7.5 to 10 in head; eye wholly in anterior third of head in adults, 5.0 to 6.0; postorbital part of head 3.7 to 4.7 in length; maxillary rounded distally, not quite reaching joint of mandible, 1.75 to 1.85 in head; mandible 1.75 to 1.85; cheek very long and narrow, much longer than snout and eye in adults; gill rakers long, slender, increasing greatly in number with age, about 25 on lower limb of first arch in specimens about 50 mm. long, about 60 in specimens 140 mm. in length; scales thin, moderately adherent, with slightly uneven edges; dorsal fin rather low, the longest rays not nearly reaching tip of last one if deflexed, origin of fin about equidistant from anterior margin of eye and base of caudal; anal moderately long and low, its origin under posterior half of base of dorsal, its base 4.6 to 5.0 in length; ventral reaching somewhat more than halfway to origin of anal, inserted a little nearer origin of anal than base of pectoral; pectoral generally failing to reach base of ventral by diameter of pupil, 2.15 to 2.6 in head, 6.2 to 7.2 in length; axillary scale of pectoral about three-fourths length of fin, 3.05 to 3.9 in head.

Color bluish gray above; sides silvery, especially sides of head; young with a silvery lateral band, becoming indistinct and disappearing at a length of about 85 to 100 mm.; back with dusky punctulations, these continued on caudal fin.

This species is represented in the collection made by the Mission by three small specimens, 41 to 55 mm. long, dredged off the mouth of the Piura River in Sechura Bay. The description is based on these specimens, and larger ones from Panama Bay.

Range.—Gulf of California to northern Peru.

Family MAUROLICIDAE

Body moderately elongate, compressed; margin of upper jaw formed by maxillaries and premaxillaries, each provided with teeth; barbels wanting; gill openings wide, the first arch extending forward to symphysis of lower jaw; pseudobranchiae present; air bladder wanting; series of photophores extending along lower part of side of head, body, and tail; scales at least sometimes present; dorsal fin single, with soft rays only; adipose fin small or rudimentary.

A single genus is known from off the coast of Peru.

Genus VINCIGUERRIA Jordan and Evermann, 1896

Body oblong to elongate, fairly compressed; head compressed, its bones thin, but ossified; mouth large; maxillary extending beyond posterior margin of eye; teeth in a single series on margins of both jaws, on palatines and sometimes on vomer; gill rakers well developed; lower part of body anteriorly with two rows of photophores, the upper row ending at or near origin of anal, the lower row almost continuous from isthmus to base of caudal; each organ pearllike, and set in a black socket, directed more or less downward; scales present in at least one species; dorsal on posterior half of body; anal short, with about 14 or 15 rays; color chiefly bright silvery.

One species, which appears to be new, is included in the Peruvian collections that were examined. The members of the genus have not been studied thoroughly, and their relationship remains obscure. Few specimens even now are available for study, and it has been necessary to rely chiefly on rather inadequate descriptions.

VINCIGUERRIA PACIFICI, new species

FIGURE 23

Head 3.7 to 4.0; depth 6.5 to 7.2; D. 13 or 14; A. 15; V. 7; P. 9 or 10; vertebrae 41 (one specimen dissected).

Body quite elongate, compressed, its greatest thickness slightly exceeding half its depth; caudal peduncle moderately slender, 5.0 to 5.7 in head; head rather long, compressed, its depth at margin of preopercle 1.7 to 1.8 in its length; snout pointed, bent upward at tip, 4.33 to 4.8 in head; eye 3.5 to 4.2; interorbital slightly concave, with a narrow shelflike projection over eye, and low ridges and grooves extending forward on snout, 5.9 to 7.0 in head; mouth large; lower jaw projecting rather strongly, pointed, not extending into dorsal profile; maxillaries forming rim of upper jaw posterior to region of nostrils, broadly curved, extending well beyond posterior margin of eye, 1.5 to 1.6 in head; teeth small, pointed, in a single series on margin of maxillaries and premaxillaries, and in a single series laterally on lower jaw, 1 tooth on each side on vomer, and a row of about 5 on each palatine; opercle with a prominent angle at beginning of upper series of photophores, and an indentation at the lower series; gill rakers well developed, those at angle about two-thirds diameter of eye, 21 to 23 on lower and 9 to 11 on upper limb of first arch; lateral line apparently undeveloped; 2 rows of photophores present on lower part of side, the upper one beginning above base of pectoral and extending to origin of anal, with 11 organs in advance of ventral and 11 behind it; lower row beginning on isthmus, and extending to base of caudal with a slight interruption at origin of anal, 7 organs on isthmus, 14 from isthmus to ventral, 10 from ventral to origin of anal and 14 from origin of anal to base of caudal; 2 on opercle in advance of upper row, 1 at lower posterior margin of eye, 1 in front of lower part of eye, a pair near tip of mandible, a row of 8 on bases of branchiostegal arches; scales mostly lost in the specimens studied, making an enumeration impossible, very thin, and at least posteriorly very large; dorsal somewhat elevated anteriorly, the longest rays about as long as snout and eye, posterior rays very short, its origin about an eye's diameter behind base of ventral, and a little nearer tip of snout than tips of longest caudal rays, its distance from tip of snout 1.65 to 1.8 in length; adipose fin apparently very small, about equidistant from origin of dorsal and tips of longest caudal rays, and over or just behind last ray of anal; caudal moderately forked, about as long as head without snout; anal similar to dorsal, its origin under eighth to tenth ray of dorsal, its base 5.6 to 6.7 in length; ventral long, reaching more than halfway to anal, fully half length of head, inserted equidistant from tip of snout and base of caudal; pectoral inserted on ventral edge, below margin of opercle, 6.1 to 6.9 in length.

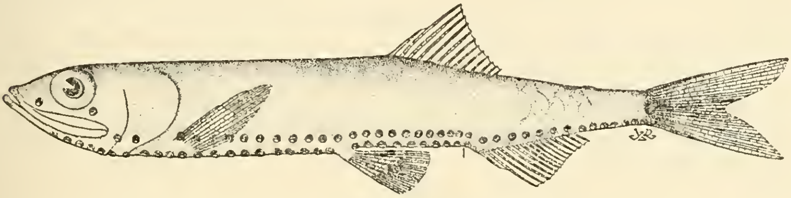

FIGURE 23.—*Vinciguerria pacifici*, new species. From the type, 58 mm. long, off Lobos de Afuera Island, Peru (U.S.N.M. No. 128176).

Color apparently largely dusky above; sides and ventral surface bright silvery; light organs surrounded by dark at base, the sockets being black; fins exclusive of the ventrals, with dark punctulations; base of caudal with an irregular dark bar.

The collection made by the Mission contains seven specimens, 57 to 65 mm. (48 to 55 mm. to base of caudal) long. These fishes, as shown by the label with them, were removed from the stomach of a "skipjack," *Katsuwonus pelamis* (Linnaeus), caught 50 miles south of Lobos de Afuera Island, at latitude 7° 47′ S., longitude 80° 32′ W., on a line trawl in 20 fathoms. The specimens are in fair condition, nearly all characters being satisfactorily preserved in one or more individuals. A specimen (U.S.N.M. No. 128176) 58 mm. (48 mm. to base of caudal) long has been selected as the type. On it the following proportions and enumerations are based: Head 4.0 in length; depth 7.15; distance from tip of snout to dorsal 1.65; base of anal 6.9; pectoral 6.9. Eye 3.5 in head; snout 4.8; interorbital about 6.0; maxillary 1.5; caudal peduncle 5.0. D. 13; A. 15; V. 7; P. 10; gill rakers 9 + 22.

This apparently new species agrees with *V. lucetia* (Garman), the only other species of the genus reported from the eastern Pacific, in the number and arrangement of the photophores and also in the number of fin rays. However, according to Garman's description and figure (no specimens being available for comparison), the fish herein described is much slenderer, the head is longer, the eye smaller, the dorsal is farther back on the body, the ventrals are farther forward, and the caudal fin seems to be proportionately shorter. Garman (1899, p. 242) gave: Head 4.0 and depth 6.0 "in total length"; eye 2.85 in head; origin of dorsal equidistant from snout and base of caudal, though indicated as somewhat farther back in the figure; ventrals about equidistant from nostril and base of caudal, and according to the figure they are inserted notably less than an eye's diameter in advance of dorsal; and the caudal fin was described as nearly as long as head. The very slender body and the posterior position of the dorsal apparently separate this new form, also, from *V. attenuata* (Cocco) from the Atlantic, as well as the other species of the genus. Gilbert (1908, p. 237) suggested that the various forms already described might prove to constitute "a variable and widespread species for which the name *attenuata* must be used." However, in the absence of such proof it seems advisable to name and describe this very slender form from Peru, as it does not come within the range of variability of those already described.

Range.—Known only from off northern Peru, at latitude 7°47′ S., longitude 80°32′ W.

Family SYNODONTIDAE: Lizardfishes

Body elongate, little if at all compressed; mouth very large, entire margin of upper jaw formed by premaxillaries; maxillaries if present closely adherent to premaxillaries; gill membranes nearly or quite separate; branchiostegal rays usually numerous; teeth generally pointed, present in both jaws, on palatines, and on tongue; scales usually present, cycloid; lateral line present; alimentary canal short; air bladder small or wanting; dorsal and anal fins moderate or short, with soft rays only; caudal forked.

A single genus comes within the scope of the present work. Most of the species inhabit sandy shores.

Genus SYNODUS Gronovius, 1763

Body elongate, more or less rounded, the peduncle usually somewhat compressed; head depressed, the bones of upper surface more or less rugose; snout variously pointed, triangular if viewed from above, as long as or longer than eye; interorbital generally slightly concave; mouth large, oblique, bordered above by the long premaxillaries; rudimentary maxillary closely connected with premaxillary; teeth in 1 or 2 series in upper jaw, unequal in size, compressed, pointed, some of them depressible, a band of similar teeth in lower jaw and on palatines, also present on tongue and basibranchials (the number of rows of teeth and the width of the bands apparently rather variable with age); scales cycloid, missing on upper surface of head, but present on cheeks and opercles; lateral line straight, posteriorly with or without a keel; 12 to 16 branchiostegal rays; gill rakers virtually undeveloped; dorsal about over middle of body, with 10 to 15 rays; anal placed posteriorly, with 8 to 15 rays: adipose small, over the anal base; ventral not far behind pectoral, with 8 rays, the inner ones longer than the outer ones; pectoral rather short; caudal forked.

Four species are included in the Peruvian fauna, two of which appear to be new. The genus heretofore was not reported from Peru.

KEY TO THE SPECIES

a. Anal with 10 to 14 rays; head large, 3.4 to 4.8 in length.
  b. Anal with 13 or 14 rays; scales 63 to 66 in lateral series, 24 or 25 rows crossing back in advance of dorsal fin; snout long, sharply pointed, 2.95 to 3.4 in head; eye small, 6.3 to 7.6 in head----- **scituliceps** (p. 109)
  bb. Anal with 10 to 12 rays; scales fewer; snout shorter, less sharply pointed, 3.5 to 4.5 in head; eye larger, 4.3 to 5.8 in head.
    c. Scales moderately small, 56 to 59 in lateral series, 20 to 22 crossing back in advance of dorsal fin; pectoral with 13 or 14 rays; mandible not sharply pointed, without a definite fleshy knob at tip, but with vertical fleshy folds of skin along its margins near tip. **sechurae**, new species (p. 111)
    cc. Scales large 45 to 50 in a lateral series, 15 or 16 rows crossing back in advance of dorsal fin; mandible more sharply pointed, with a definite fleshy knob at tip, and no folds of skin along margins. **evermanni** (p. 113)
aa. Anal with 8 or 9 rays; head small, 5.0 to 5.4 in length; pectoral with 11 rays; dorsal with 12 rays------------------- **marchenae**, new species (p. 114)

SYNODUS SCITULICEPS Jordan and Gilbert

Synodus scituliceps JORDAN and GILBERT, 1882b, p. 344, Mazatlán, Mexico (original description; compared with *S. foetens* (Linnaeus).—MEEK and HILDEBRAND, 1923, p. 221, Panama Bay (synonymy; description; close relationship with *S. foetens* (Linnaeus) discussed; range. However, the specimens identified as this species in part are *S. sechurae*, herein described as new).—NORMAN, 1935, p. 119 (synonymy; description; range; relationship with *S. foetens* (Linnaeus) discussed).

Synodus jenkinsi JORDAN and BOLLMAN, 1890, p. 153, Panama Bay; Guaymas, Mexico (original description; compared with *S. scituliceps*. At least one of the paratypes is *S. sechurae*, herein described as new).

Head 3.9 to 4.3; depth about 7.7 to 8.8; D. 10 or 11; A. 13 or 14; P. 13; scales 63 to 66, 4 complete rows between base of dorsal and lateral line, 24 or 25 crossing back in advance of dorsal fin.

Body rather slender, somewhat compressed; caudal peduncle moderately compressed, its depth 3.9 to 4.8 in head; head depressed, its width exceeding its depth by about half diameter of eye at margin of preopercle; interorbital 2.0 to 2.9 in snout; upper anterior rim of orbit with small serrae, its upper posterior rim slightly rough, without definite serrae; snout narrow, pointed, projecting prominently beyond mandible, 2.95 to 3.4 in head; mandible sharply pointed, ending in a small fleshy knob, laterally without definite folds of skin; eye 6.3 to 7.6 in head, or 2.0 to 2.35 in snout; mouth large, premaxillary reaching far beyond eye, 1.6 to 1.7 in head; scales small, with membranous borders, circulae well marked; dorsal fin high, the longest rays may or may not reach tip of the last somewhat produced ray, 1.5 to 1.65 in head, origin of fin equidistant from adipose and anterior margin of eye, or a little nearer the latter; adipose a little in advance of middle of base of anal; caudal fin short, the upper lobe the longer, a little longer than premaxillary; anal much lower than dorsal, its base a little longer, 1.6 to 1.8 in head; inner rays of ventral nearly twice as long as the outer one, reaching about halfway to origin of anal, 1.45 to 1.85 in head; pectoral short, rounded or somewhat pointed, variable, failing to reach ventral, 1.85 to 2.25 in head.

Color grayish above, silvery on side, pale underneath; some specimens rather plain, others with pale spots or reticulations on head, the spots extending backward to or beyond dorsal fin; some specimens with rather definite dark lines along rows of scales above lateral line; tip of mandible largely black; adipose partly black; dorsal, lower lobe of caudal, and pectoral generally more or less dusky; fins otherwise pale; a black spot at base of first ray of dorsal, and at base of upper ray of pectoral usually present.

The description is based on five specimens, 128 to 228 mm. (110 to 193 mm. to the base of the caudal) long, secured by the Mission, mostly with an otter trawl in Paita Harbor, Sechura Bay, and at San Lorenzo Island. The proportions, based on a sixth small specimen 55 mm. long, were not included, because they differ considerably from the adult, and tend to confuse the comparison of proportions of adult examples with other species. The following proportions pertain to the small example: Head 3.9 in length; depth 11.4; eye 5.75 in head, or 1.5 in snout; snout 3.75 in head; interorbital 2.7 in snout; premaxillary 1.95 in head; pectoral 2.5. This small specimen is pale, and retains traces of juvenile color markings, consisting of indefinite dark spots on the ventral surface, short bars on the back, and some black at base of caudal.

I have examined the type (U.S.N.M. No. 41171) of *Synodus jenkinsi* Jordan and Bollman, which is this species. However, at least one of the paratypes (U.S.N.M. No. 41409) of *S. jenkinsi* is *S. sechurae*, herein described as new.

Range.—Gulf of California to Peru. The Galápagos Islands have been included in the range given in published accounts. However, I am unable at this time to find the source of that record. The species previously was not recorded from Peru.

SYNODUS SECHURAE, new species

Figure 24

Head 4.15; depth about 8.5; D. 11; A. 12; P. 14; scales 59, 4 complete rows between base of dorsal and lateral line, 21 rows crossing back before dorsal fin.

Body apparently as broad as deep at base of ventrals (somewhat distorted); caudal peduncle somewhat compressed, its depth 4.45 in head; head notably depressed, its width exceeding its depth at margin of preopercle by only a little less than diameter of eye; interorbital 2.25 in snout; upper anterior rim of orbit with prominent serrae, the upper posterior rim rough but without definite serrae; snout only moderately long, not sharply pointed, not projecting far beyond mandible, 3.75 in head; mandible bluntly pointed, without a definite fleshy knob, with definite vertical folds of skin laterally near tip; eye moderately large, 5.8 in head, 1.5 in snout; mouth large, premaxillary extending about an eye's diameter beyond orbit, 1.7 in head; scales with membranous borders, the circulae well marked; dorsal fin high, the longest rays not quite reaching tip of the last somewhat produced one if deflexed, 1.5 in head, origin of fin a little nearer anterior margin of eye than adipose fin; adipose over middle of base of anal; caudal fin short, the upper lobe the longer, a little longer than premaxillary; anal much lower than dorsal, its base a little longer, 1.7 in head; inner rays of ventral fully twice as long as the outer ones, reaching halfway to anal, 1.25 in head; pectoral somewhat pointed, reaching opposite base of ventral, 1.8 in head.

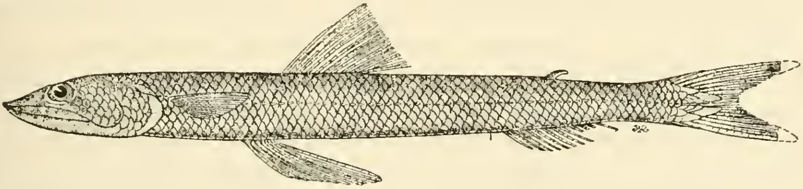

Figure 24.—*Synodus sechurae*, new species. From the type, 150 mm. long, Sechura Bay, Peru (U.S.N.M. No. 127829).

Color grayish above, side somewhat silvery, pale below; upper surface of head and back in advance of dorsal with numerous pale gray specks, becoming fewer posteriorly; sides of head with dark spots; rows of scales on sides with indications of dark lines. Adipose anteriorly black; dorsal, caudal (especially the lower lobe), and pectoral dusky; other fins pale; mandible with a dark cross bar just posterior to its tip; a dark spot at base of first dorsal ray and at base of upper ray of pectoral.

The Mission obtained with an otter trawl a single specimen, 150 mm. (128 mm. of base of caudal) long, in Sechura Bay. The foregoing description is based on that specimen (U.S.N.M. No. 127829), which becomes the type of the species. Apparently it was under pressure during the hardening process, which depressed its midsection. In other respects it is in good condition.

In addition to the Peruvian specimen there are 4 examples in the National Museum (U.S.N.M. Nos. 41409, 79622, and 79624) from Panama Bay, one of these (41409) being a paratype of *S. jenkinsi*, and a specimen (U.S.N.M. No. 54506) from the southern part of the Gulf of California (taken at lat. 24°16′ N.; long. 110°22′ W.), which also belong to this species. Among these specimens are 4 adults 118 to 260 mm. in length and a juvenile 49 mm. long. The following proportions and enumeration are based on the 4 adult examples mentioned: Head 4.1 to 4.8 in length; depth 7.4 to 9.7. Eye 5.35 to 5.75 in head, or 1.2 to 1.65 in snout; snout 3.5 to 3.8 in head; interorbital 6.65 to 9.6 in head, or 1.9 to 2.5 in snout; premaxillary 1.55 to 1.7 in head; anal base 1.6 to 1.8; ventral (longest ray) 1.15 to 1.3; pectoral 1.7 to 2.0. D. 10 or 11; A. 11 or 12; P. 13 or 14; V. 8; scales 56 to 59, 4 complete rows between lateral line and base of dorsal, and 20 to 22 series crossing back in advance of dorsal. The width of the body definitely exceeds the depth at base of ventrals, being more or less depressed as far back as the adipose where the depth and width are about equal. The larger specimens are more definitely and more profusely spotted than the smaller ones. The two largest specimens, 173 and 260 mm. long, have a series of 7 or 8 enlarged pale gray spots, which approximately follow the third row of scales above the lateral line. Only slight suggestions of these spots are present on the type. The vertical membranous folds on the edge of the mandible are especially prominent in the larger specimens.

This species differs from *S. scituliceps*, with which it has been identified, in several respects. The principal differences are set forth in the following parallel columns:

S. scituliceps	*S. sechurae*
Scales small, 63 to 66 in a lateral series, 24 or 25 crossing back in advance of dorsal fin.	Scales larger, 56 to 59 in a lateral series, 20 to 22 crossing back in advance of dorsal fin.
Anal with 13 or 14 rays, usually 13.	Anal with 11 or 12 rays, usually 12.
Snout long, sharply pointed, extending well beyond tip of mandible, 2.95 to 3.4 in head.	Snout shorter, notably less sharply pointed, extending little beyond tip of mandible, 3.5 to 3.8 in head.
Mandible very sharply pointed, with a small but definite fleshy knob at tip, its lateral margins without definite folds of skin.	Mandible less sharply pointed, with an indefinite fleshy knob at tip, its margins near tip with definite vertical folds of skin.
Eye small, 6.3 to 7.6 in head, and 2.0 to 2.35 in snout.	Eye larger, 5.35 to 5.8 in head, and 1.2 to 1.65 in snout.

Range.—Gulf of California to northern Peru.

SYNODUS EVERMANNI Jordan and Bollman

Synodus evermanni Jordan and Bollman, 1890, p. 152, Panama Bay, in 33 fathoms (original description; compared with *S. poeyi* Jordan).—Meek and Hildebrand, 1923, p. 219, Panama Bay (references; description; range).—Norman, 1935, p. 106 (synonymy; description; range).

Head 3.55; depth 9.8; D. 12; A. 11; P. 12; scales mostly lost, about 55, 4 rows between lateral line and base of dorsal, and about 16 crossing back in advance of dorsal fin.

Body about as broad as deep at base of ventral fins; caudal peduncle compressed, its depth 4.5 in head; head flat above, its width and depth at margin of preopercle about equal; interorbital wide, 1.45 in snout; rim of orbit smooth; snout rather abruptly pointed, outline horizontal, or curved upward very slightly dorsally at tip, projecting slightly beyond mandible, 4.0 in head; mandible sharply pointed, with a fleshy knob at tip, no folds of skin along its lateral margins; eye large, 4.5 in head, 1.12 in snout; mouth extending well beyond eye; premaxillary 1.65 in head; dorsal fin high, the longest ray reaching slightly beyond tip of last one, which is not longer than the immediately preceding one, the longest one 1.35 in head, origin of fin a little nearer adipose than tip of snout; adipose over middle of anal; caudal fin rather short, the upper lobe the longer, exceeding length of premaxillary; anal lower and a little shorter than dorsal, its base 2.0 in head; inner rays of ventral rather long, about 1.5 times as long as the outer ray, 1.5 in head; pectoral with rounded margin, rather long, reaching nearly an eye's diameter beyond base of ventral, 1.55 in head.

Color grayish brown above, pale underneath; a few indefinite dark spots on posterior part of back, and a more definite series on side, some of which are vertically elongate. Pectorals and ventrals pale; other fins more or less dusky; the adipose black at base; a small dark spot at base of first ray of dorsal.

The Mission obtained a single small specimen, 75 mm. (64 mm. to base of caudal) long, in Chilca Bay, constituting a new record for Peru. The foregoing description is based on this small fish, which was compared with larger specimens from Baja California and from Panama Bay. The following proportions and enumerations based on larger specimens (140 to 220 mm. long), including the type material from Panama Bay, may be useful in identifying larger specimens: Head 3.4 to 3.8 in length; depth 6.6 to 8.5. Eye 4.3 to 5.8 in head; snout 4.0 to 4.5; premaxillary 1.5 to 1.7; interorbital 5.0 to 5.8; base of anal 2.4 to 2.7; pectoral 1.5 to 1.9. D. 10 or 11; A. 10 or 11; P. 12; scales 45 to 50, 4 complete rows between lateral line and base of dorsal, and 15 or 16 rows crossing back in advance of dorsal; longest rays of the dorsal not always reaching to or beyond the tip of the last ray if depressed; body generally rather deeper than broad at base of ventrals in the larger fish; pectoral fins becoming somewhat pointed with age; dark spots on the side either very obscure or absent in the largest specimens (190 to 210 mm. long) at hand.

This species differs from the others herein recorded in the larger eye; broader interorbital; shorter anal, with fewer rays; and in the notably longer pectoral, which reaches far beyond base of ventral.

Range.—Baja California to Peru. Previously recorded from only as far south as Panama Bay.

SYNODUS MARCHENAE, new species

FIGURE 25

Synodus japonicus FOWLER (in part at least not of Houttuyn), 1932, p. 4, Charles Island, Hood Island, Galápagos; and Nukuhiva, Marquesas Islands.

Head 5.0 to 5.4; depth 9.8 to 11; D. 12; A. 8 or 9; P. 11 or 12; scales undeveloped.

Body a little deeper than broad; caudal peduncle moderately stout, 4.4 to 4.7 in head; head as broad as deep; interorbital broad, without definite ridges, 5.4 to 6.3 in head, 1.18 to 1.27 in snout; rim of orbit smooth; snout short, its upper outline oblique, projecting slightly beyond mandible, about as long as eye, 4.5 to 5.0 in head; mandible rather blunt, without an evident fleshy knob; eye large, 4.3 to 4.9 in head; mouth small (for a *Synodus*), the premaxillary reaching little beyond posterior margin of eye, 1.75 to 2.0 in head; dorsal fin low, none of the rays reaching beyond the tips of the succeeding ones if deflexed, origin of fin about an eye's diameter nearer tip of snout than adipose; adipose over posterior half of anal base; caudal rather broadly forked, the upper lobe the longer, about as long as head without snout; anal notably smaller and lower than dorsal, its base 2.4 to 2.8 in head; ventral pointed, next to innermost ray longest, more than twice length of outermost one, 1.1 to 1.2 in head; pectoral moderate, somewhat pointed, reaching to or slightly beyond base of ventral, 1.65 to 2.0 in head.

Color very pale; general pigmentation not developed because of youth; several faint dark spots (remnants of larval markings) evident on abdomen; back with 6 to 8 dark cross bars, those between dorsal and adipose generally more or less double; a prominent crescent-shaped dark bar at base of caudal, extending somewhat on lobes of fin; occiput with large brown chromatophores, a dark dot at base of each anal ray, and a dark median line behind anal extending half way to base of caudal (being juvenile markings).

The Mission secured a single immature specimen about 45 mm. long to base of caudal, which is in bad condition (now in two pieces), probably having been disgorged by a larger fish. According to the label with the specimen it was taken under a "submarine light" at Mazorka Island in the Huarura group. It is readily identifiable with seven specimens from the Galápagos Islands and one from Colombia.

The specimens are all immature and vary only from about 53 to 59 mm. (46 to 51 mm. to base of caudal) in length. The Galápagos specimens consist of two lots, one of five specimens taken "at anchorage," near Charles Island, by the Pinchot Expedition to the South Seas, and another of two specimens also taken "at anchorage," at Marchena (Bindloe) Island, by W. L. Schmitt. The Colombian specimen too was collected by Dr. Schmitt, and was caught in Octavia Bay, "in 2 fathoms."

Although the specimens are all scaleless, and void of general pigmentation, and the intestine is not fully invaginated, the fins are well developed, and the teeth are arranged about as usual in the genus. If the development of the young is similar to that of *S. foetens* (Linnaeus), of which a series is before me, the body in the immature specimens herein described will increase in proportionate depth, the head will diminish slightly in length, the proportions of the eye and snout will remain about the same, and the width of the interorbital will increase rather greatly. If a similar development should take place the species represented by the young forming the basis for this account would always be characterized by a short head, large eye, short snout, and a broad interorbital.

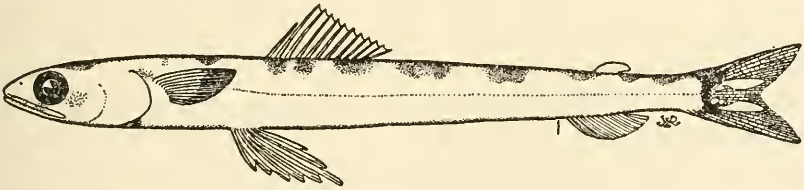

FIGURE 25.—*Synodus marchenae*, new species. From the type, 58 mm. long, Marchena Island, Galápagos (U.S.N.M. No. 120171).

The lot of five specimens taken by the Pinchot Expedition were recorded as *S. japonicus* (see reference to Fowler above), a widely distributed species in the South Seas. However, they cannot be of that species as a specimen from Rose Island, only 57 mm. long, already is completely scaled and fully pigmented, and furthermore it and larger ones differ in several proportions, although the number of fin rays and cross bands on the back is correct. *S. lacertinus* Gilbert, recorded from Panama Bay, also agrees in the number of fin rays, but it too becomes adult at a much smaller size, a specimen 58 mm. long being completely scaled and fully pigmented. At that size *S. lacertinus* has a much larger head (3.8 in length), larger mouth (premaxillary 1.6 in head), and a much narrower interorbital (12.5 in head).

As the specimens at hand do not seem to be identifiable with any known species, I propose for them the name *S. marchenae* after the island where the specimen selected as the type (U.S.N.M. No. 120171) was taken. It is 58 mm. (49 mm. to base of caudal) long. The following proportions and enumerations are based on this specimen: Head 5.4 in length; depth 10. Eye 4.4 in head; snout 4.5; interorbital 5.4; premaxillary 1.9; anal base 2.4; ventral (longest ray) 1.12; and pectoral 1.75. D. 12; A. 9; P. 11; and V. 8. Judged from the immature condition of these rather large specimens, having attained a size at which several other species are known to be adult, the species represented probably attains a large size.

Range.—Colombia to Peru and the Galápagos Islands.

Family MYCTOPHIDAE: Lanternfishes

Body oblong to moderately elongate, more or less compressed; mouth large; entire margin of upper jaw formed by the slender premaxillaries; maxillary narrow, adhering closely to premaxillary; teeth usually pointed, in bands, present on jaws, vomer and palatines, and sometimes on tongue; no barbels; gill openings wide; gill membranes separate and free from the isthmus; branchiostegals 8 to 10; pseudobranchiae present; lateral line usually present; photophores more or less regularly placed on lower part of body, large ones often present on head and on caudal peduncle; scales present, extending on cheeks and opercles; dorsal fin short, with soft rays only, near midlength; adipose fin present; caudal forked; anal generally rather short; ventrals and pectorals well developed.

One genus is included in the Peruvian collections studied. The family is composed of small fishes, very widely distributed in open seas. Some of the species live at considerable depths, whereas others live at or near the surface at least at times.

Genus MYCTOPHUM Rafinesque, 1810

Body fairly short, compressed; head short, compressed; snout blunt; eye large; mouth large; jaws generally about equal; gill rakers rather long and slender; only two photophores at base of caudal, usually well separated from peduncle series; photophores along anal and peduncle in two groups; scales cycloid, those in lateral line at least somewhat enlarged; dorsal fin beginning well in advance of anal, though generally overlapping it posteriorly; ventral inserted under or a short distance in front of dorsal, with seven or eight rays.

Two species are included in the Peruvian collections studied.

KEY TO THE SPECIES

a. Caudal peduncle extremely slender, 5.25 in head; 19 photophores along base of anal and ventral edge of caudal peduncle; ventral with 7 rays. **teniculum** (p. 117)

aa. Caudal peduncle not especially slender, 3.5 in head; 14 photophores along base of anal and edge of caudal peduncle; ventral with 8 rays. **affine** (p. 118)

MYCTOPHUM TENICULUM Garman

Myctophum teniculum Garman, 1899, p. 262, pl. J, fig. 5, lat. 6°21′ N., long. 80°41′ W. (about 75 miles south of the Province of Las Santos, Panama), surface (original description).

Myctophum coccoi Parr (probably in part not of Cocco), 1928, p. 61 (diagnosis in key; synonymy; note; range).

Head 4.0; depth 4.0; D. 11; A. 19; V. 7; P. 13; scales 41.

Body anteriorly deep, compressed, its greatest thickness only about two-fifths its depth, tapering strongly over base of anal; peduncle very long and slender, 5.25 in head; head short, deep, compressed; snout short, bluntly pointed, 7.7 in head; eye 3.6; interorbital convex, forming a narrow shelf over eyes, 3.4; mouth slightly inferior; lower jaw included; maxillary very narrow, reaching well beyond posterior rim of orbit, or nearly to margin of preopercle, 1.6 in head; teeth minute, pointed, in a very narrow band on margin of premaxillaries, and on margin of mandible, in a single series on vomer and palatines; lateral line nearly straight, complete; photophores in an almost continuous row along ventral edge of trunk and tail, slightly interrupted at base of ventral and origin of anal, the organs being a little nearer the median ventral line between these points; 5 organs in advance of ventral, 4 between ventral and anal, and 19 along base of anal and ventral edge of peduncle, the last two separated from the others by a somewhat longer interval; a median series of 5 large light organs on peduncle behind anal; a row of 3 organs on branchiostegals; 1 behind margin of preopercle, somewhat above maxillary; 1 median one on interorbital; 3 on shoulder girdle, 1 above and 1 below base of pectoral, and 1 still lower and partly under opercle; 2 above ventral fin, on third row of scales below lateral line; 1 above and a little in advance of vent, between second and third rows of scales below lateral line; 2 on first row of scales below lateral line, the first over third anal ray and the second over the eleventh ray; scales along lateral line much enlarged, 3 complete rows between lateral line and first ray of dorsal, extending on dorsal, caudal, and anal fins; dorsal rather small, the longest rays about as long as postorbital part of head, its origin well in advance of midlength, its distance from snout 2.3 in length; adipose well developed, over posterior part of anal; caudal damaged, forked according to Garman (see reference above); anal somewhat elevated anteriorly, its origin a little behind middle of dorsal; and equidistant from tip of snout and base of caudal, its base 4.0 in length; ventral inserted about an eye's diameter behind pectoral, and equidistant from posterior end of maxillary and origin of anal; pectoral somewhat below middle of side, near margin of opercle, damaged, its length certainly greater than half length of head.

Color dusky brown above; silvery gray to brownish on side and below; opercle and first row of scales anteriorly above lateral line with dark punctulations; photophores surrounded by dark color, and often with narrow black ring extending across upper part of some of the organs; dorsal, caudal, and anal somewhat dusky; other fins pale.

One specimen about 47 mm. (40 mm. to base of caudal) long, was taken by the Mission in a surface net at latitude 4°24′ S., longitude 81°35′45″ W., that is, off northern Peru. This specimen agrees well with the original description and figure of the type of *M. teniculum,* though the minute light organ at angle of mouth is not evident in the specimen herein described.

M. teniculum was synonymized with *M. coccoi* Cocco by Parr (see reference above). However, the specimen at hand, and evidently the type also, differ in so many respects from specimens of *M. coccoi* (U.S.N.M. No. 100470), from the vicinity of Bermuda, that I hesitate to follow Parr. If they are identical, greater variation than ordinarily exists among specimens of one species would have to be admitted. The body in the Peruvian specimen is much deeper, the head is longer, the anal and ventral rays are fewer, and the gill rakers on the upper limb of the first arch are more numerous. The following proportions and enumerations are based on four specimens, 40 to 60 mm. (36 to 43 mm. to base of caudal) long, from the Atlantic: Head 4.3 to 4.6 in length; depth 4.9 to 5.3. A. 21 or 22; V. 8; gill rakers 3 or 4+7 or 8. It is not evident from the literature consulted that the differences shown are covered by individual variation.

Range.—Panama to Peru. Pelagic.

MYCTOPHUM AFFINE (Lütken)

Scopelus affinis Lütken, 1892, p. 252, open Atlantic (original description).
Myctophum affine Parr, 1928, p. 69, fig. 8, Atlantic, Pacific, and Indian Oceans (synonymy; discussions; tables).

Head 3.6; depth 4.15; D. 13: A. 18; V. 8; P 12; scales 37.

Body rather deep, compressed, its greatest thickness half its depth, tapering posteriorly; peduncle only moderately slender, 3.5 in head; head moderately short, compressed; snout blunt, 8.2 in head; eye 2.9; interorbital forming a shelf over eyes, 3.4; mouth oblique, terminal; maxillary narrow, extending well beyond posterior rim of orbit, 1.5 in head; teeth as in *M. teniculum;* lateral line complete, little decurved; photophores in a more or less continuous row along ventral edge of trunk and tail, 5 in advance of ventral fin, 4 between ventral fin and origin of anal, and 14 from origin of anal to base of caudal; a long space between the last organ in advance of anal and the first opposite base of anal, a somewhat shorter interval between the seventh and eighth organs along base of anal, and a similarly long space separating the last two organs on base of caudal; 2 large light organs on median ventral line of peduncle; 3 along lower jaw; 1 on interorbital; 1 behind preopercular margin, 1 above and 1 just below base of pectoral, and 1 lower down on shoulder girdle behind margin of opercle; 1 on side at tip of pectoral; an oblique series of 3 between last organ in front of ventral series and lateral line; and 1 just below lateral line and at vertical from eighth organ along base of anal; scales along lateral line enlarged, 3 complete rows between lateral line and first dorsal ray; dorsal over middle of body, its distance from tip of snout 2.2 in length; adipose well developed, over posterior part of anal; caudal damaged; anal short, its origin under about tenth ray of dorsal, much nearer base of caudal than tip of snout, its base 3.8 in length; ventral inserted a little in advance of dorsal, much nearer origin of anal than end of maxillary; pectoral somewhat below middle of body, near margin of opercle, 1.4 in head.

Color dusky brown above; silvery gray to brownish on side and below; most of lower parts of body with dark brown punctulations; base of photophores black; dorsal and caudal slightly brownish; other fins pale.

One specimen, about 62 mm. (50 mm. to base of caudal) long, was taken by the Mission in a surface net, at latitude 5°29′30″ S., longitude 81°42′W., that is, off northern Peru. This example comes well within the limits of *M. affine* as understood by Parr (see reference above). However, Bolin (1939, p. 110) expressed grave doubt as to the correctness of including under one name the examples of wide divergence assigned to it by Parr.

Range.—Atlantic, Pacific, and Indian Oceans. Pelagic.

Family ARIIDAE: Sea Catfishes

Body moderately robust anteriorly, tapering to a fairly slender caudal peduncle; head large, usually quite broad; mouth broad, generally more or less inferior; teeth in jaws, and usually on the vomer and palatines; maxillary with a barbel, and the lower jaw (chin) with one or more pairs of barbels; scales wanting; adipose fin present; dorsal and pectoral each with a strong spine.

Three genera are represented in the Peruvian collections studied. The members of the family, referred to as "bagre" in the report of the Mission (1943, p. 287), are said to be common in northern Peru, and as occurring as far south as "about Pisco." Rather large catches are reported from northern Peru, which are landed chiefly at Puerto Pizarro, Zorritos, and Negritos.

KEY TO THE GENERA

a. Lower jaw with one pair of barbels; maxillary barbel compressed, band-shaped ---------- **Bagre** (p. 120)

aa. Lower jaw with two pairs of barbels; maxillary barbel not band-shaped.

b. Dorsal shield enlarged, often pointed anteriorly, sometimes convex to nearly straight; palatine and pterygoid teeth united, forming a large triangular patch ---------- **Sciades** (p. 122) *bb.* Dorsal shield small, with convex anterior margin, crescent-shaped; palatine teeth in small or moderate patches, not extending on pterygoids.

c. Teeth all pointed, present on jaws, vomer, and palatines. **Galeichthys** (p. 123)

cc. Teeth in jaws pointed, none on vomer, those on palatines blunt. **Arius** (p. 127)

Genus BAGRE Cuvier, 1817

Gafftopsail Catfishes

This genus is characterized by its four barbels, the maxillary ones being broad and bandlike. The pectoral spines and usually the dorsal spine with a long, flattened filament.

Two species, one of them new to the fauna of Peru, come within the scope of the present work.

KEY TO THE SPECIES

a. Dorsal spine without a filament; 13 or 14 gill rakers on lower limb of first arch; anal fin not marked with a conspicuous dark area-- **panamensis** (p. 120)

aa. Dorsal spine provided with a long flat filament; 3 gill rakers on lower limb of first arch; anal marked with a conspicuous dark area on its anterior lobe. **pinnimaculatus** (p. 121)

BAGRE PANAMENSIS (Gill)

Bagre

Aelurichthys panamensis Gill, 1863c, p. 172, west coast of Central America (original description).

Felichthys panamensis Starks, 1906, p. 764, Guayaquil, Ecuador (notes).—Meek and Hildebrand, 1923, p. 97, Panama Bay (synonymy; description; range).

Aelurichthys scutatus Regan, 1907, p. 116, pl. 15, fig. 2, and pl. 19, fig. 2, Pacific coast of Panama, northwestern Ecuador (original description).

Head 3.4 to 3.6; depth 4.25 to 5.0; D. I, 7; A 26 to 28; P. I, 11.

Body not especially robust, its depth exceeding its width at origin of dorsal by about diameter of eye, tapering strongly posteriorly; caudal peduncle slender, compressed, its depth 3.0 to 3.5 in head; head rather broad, its greatest width equal to its length less half the snout; interorbital space moderately flat, 1.7 to 1.8 in head; snout broad, rather strongly depressed, broadly rounded, 2.5 to 2.6 in head; eye lateral, 5.0 to 5.4 in head; mouth arched forward rather strongly, its width at angles 1.8 to 1.95; teeth pointed, those on upper jaw in a narrow band, ending posteriorly in a point, slightly restricted but continuous across median line, the band on lower jaw rather narrower, interrupted at median line; vomerine patches of teeth larger than the palatine patches; gill rakers about half as long as eye, 5 or 6 on upper and 13 or 14 on lower limb of first arch; upper surface of head smooth; fontanel groove extending forward to some point between eyes, and back nearly or quite to occipital plate; this plate with a rather sharp median keel, its lateral margins rounded, its width and length generally about equal; origin of dorsal about twice diameter of eye behind base of pectoral spine; distance anterior to origin of dorsal 2.8 to 2.9 in length; dorsal spine sharply pointed, merely rough on anterior and posterior margins, without distinct barbs, not surmounted by a filament, failing by more than diameter of eye to reach tips of longest soft rays, 1.5 to 1.75 in head; adipose very short and rather high, over posterior third of anal, its base 7.5 to 8.4 in head; caudal deeply forked, the upper lobe rather narrower and notably longer than the lower one; anal long, with concave margin, its base 1.4 to 1.5 in head; ventrals short, nearly or quite reaching origin of anal, inserted about equidistant from base of pectoral spine and beginning of posterior third of anal; pectoral spine sharply pointed, with small barbs on outer margin only, with a filament extending to or beyond origin of anal, the spine 1.35 to 1.45 in head.

Color very dark metallic blue above, shading into the silvery color of sides; pale underneath; fins rather pale, the dorsal and caudal rather dusky in one specimen.

The Mission took four specimens, 233 to 275 mm. (174 to 205 mm. to base of caudal) long, with a dredge in shallow water, in the Gulf of Guayaquil, off Puerto Pizarro. Although this species has been reported from Ecuador twice, it has not previously been recorded from Peru. The specimens apparently are too young to have developed secondary sexual characters distinctly, though one specimen has rather longer fins than the others and therefore probably is a female. In large specimens from Panama the ventral fins are much longer in the female than in the male, and the anal is much more strongly elevated anteriorly. This species differs from related species in the absence of a filament surmounting the dorsal spine.

Range.—Guaymas, Mexico (from where a specimen, U.S.N.M. No. 119728, is at hand), to Puerto Pizarro, Peru.

BAGRE PINNIMACULATUS (Steindachner)

Aelurichthys pinnimaculatus STEINDACHNER, 1875b, p. 15, pl. 8 figs. 1–3, Panama, Altata (Sinaloa), and west coast of Costa Rica (original description).

Felichthys pinnimaculatus MEEK and HILDEBRAND, 1923, p. 100, Panama Bay (synonymy; description; range).

Head 3.6; depth 5.0; D. I, 7; A. 29; P. I, 11.

Body anteriorly somewhat broader than deep, tapering posteriorly; caudal peduncle moderately slender, compressed, 3.3 in head; head low and broad, its greatest width only a little less than its length; interorbital space broad, convex, 1.5 on head; snout broad, its anterior margin broadly convex, 2.75 in head; eye lateral, 7.3; mouth arched forward rather broadly, though narrower than snout, its width at angles 1.6 in head; teeth all pointed, in bands on jaws, vomer and palatines; the band on upper jaw anteriorly narrower than laterally, fully as broad as pupil at widest point, slightly interrupted on median line; the one on lower jaw similar, though not restricted anteriorly; the band on vomer and palatines continuous, crescent-shaped, of about equal width throughout, and about as broad as those in jaws; gill rakers little developed, three small ones on lower and none definitely developed on upper limb, of first arch; upper surface of head smooth; fontanel groove extending forward to opposite anterior margin of eye and backward nearly to occipital plate; this plate without an evident keel; mandibular barbels small, about equal to space bewteen anterior nostril; maxillary barbels broad, reaching to about middle of anal; origin of dorsal an eye's diameter behind upper anterior angle of gill opening; distance anterior to origin of dorsal 3.3 in length; dorsal spine with a long, flat filament, reaching base of caudal; adipose short and high, over posterior half of anal, its base 5.6 in head; caudal deeply forked, the upper lobe much longer than lower one; anal long, with a rather prominent anterior lobe, its base 1.25 in head; ventral moderately long, reaching a little beyond origin of anal, inserted about equidistant from base of pectoral and middle of anal base; pectoral spine with a long, broad filament, extending to end of anal base, the spine rough but not barbed along outer margin, 1.6 in head.

Color bluish above; silvery gray to pale below; dorsal and pectoral largely dusky, with pale filaments; adipose bluish, like the back; upper lobe of caudal dusky, the lower one pale; anal pale, with a large dark area within its anterior lobe; ventral pale, with a large dark area most evident on upper side; pectoral largely dusky, its filament, exclusive of its brownish membrane, pale; upper half of maxillary barbel pale, lower half dusky brown.

The description is based on the only specimen known from Peru, which is 600 mm. (450 mm. to base of caudal) long, taken in the Río Moche, near Salaverry, by W. L. Schmitt. The long filament attached to the dorsal spine, and the dark blotch on the anterior part of the anal readily distinguish this species from *B. panamensis*.

Range.—Gulf of California to northern Peru. Previously recorded from only as far south as Guayaquil, Ecuador.

Genus SCIADES Müller and Troschel, 1849

This genus is distinguished from related genera by the enlarged dorsal shield, which often is pointed anteriorly, though sometimes convex to nearly straight, and the occipital shield is scarcely longer than broad. The vomerine patches of teeth are narrowly separated from the much larger triangular patches of palatine-pterygoid teeth.

Only one species of the genus is known.

SCIADES TROSCHELII Gill

Sciades troschelii Gill, 1863c, p. 171, Panama Bay (original description).
Galeichthys troscheli Tortonese, 1939b, p. 230, Callao, Peru.

This species was recorded from Callao from a single specimen taken by the *Magenta* during her voyage around the world (1865–68). It has not been taken in Peru by recent collectors.

As only one species of the genus is known the generic characters, namely, the enlarged dorsal shield, and the short broad occipital shield, also distinguish the species.

The following proportions and enumerations are based on seven specimens from Panama Bay, 170 to 330 mm. long: Head in length 3.3 to 3.6; depth at origin of dorsal 4.5 to 5.2; dorsal spine 4.1 to 4.9; pectoral spine 4.4 to 5.0; anal base 6.5 to 7.0; snout to origin of dorsal 2.45 to 2.6. Eye in head 5.75 to 7.5; snout 2.5 to 3.0; interorbital 2.0 to 2.3; adipose base 2.4 to 2.7. D. I, 7; A. 17 or 18; gill rakers 4+7 or 8.

Range.—Guaymas, Mexico, to Callao, Peru.

Genus GALEICHTHYS Cuvier and Valenciennes, 1840

Galeichthys is characterized by its rather smooth head, mostly covered with skin, sometimes with more or less exposed granular plates. The teeth are pointed and are present on the jaws, vomer, and palatines, the ones on the palatines being in patches of moderate size without backward extensions.

KEY TO THE SPECIES

a. Anal with 14 to 16 rays; mouth only moderately broad, its width at angles 1.95 to 2.1 in head; eye small, 7.0 to 7.2 in head; side with a silvery (sometimes slightly reddish) band, becoming obscure anteriorly.
peruvianus (p. 123)

aa. Anal with 17 to 19 rays; mouth broader, its width at angles 2.5 to 2.7 in head; eye larger, quite elongate, 5.75 to 6.25 in head; side without a band.
jordani (p. 125)

GALEICHTHYS PERUVIANUS Lütken

Bagre

Figure 26

Galeichthys peruvianus Lütken, 1874, p. 205, Callao, Peru (original description).—Steindachner, 1875b, p. 34, Callao, Peru; Panama Bay; and Altata, Mexico (notes on abundance and relationship).—Evermann and Radcliffe, 1917, p. 31, La Ventanilla, Peru (description).—Nichols and Murphy, 1922, p. 506, North Chincha Island and Callao, Peru.—Tortonese, 1939b, p. 230, Callao, Peru.

Tachysurus peruvianus Eigenmann and Eigenmann, 1888, p. 140, Callao, Peru; 1890, p. 51, fig. 7 (teeth), Callao, Peru (description).—Fowler, 1941a, p. 369 (references).

Head 3.2 to 3.4; depth 4.7 to 5.1; D. I, 7; A. 14 to 16; P. I, 10 or 11.

Body scarcely deeper than broad at origin of dorsal, tapering posteriorly; caudal peduncle slender, its depth 3.8 to 4.4 in head; head moderately depressed, its greatest width about equal to its length without snout; interorbital space 2.0 to 2.1 in head; snout broadly rounded, 2.7 to 2.9 in head; eye lateral, 7.0 to 7.2 in head; mouth moderately broad, its cleft extending somewhat beyond posterior nostril, its width at angles 1.95 to 2.1 in head; teeth pointed, in a broad band in each jaw, and a similar one on vomer and palatine, the vomerine teeth well separated on median line, but continuous with the palatine teeth in the three specimens at hand (not as described and figured by Eigenmann and Eigenmann (1890, p. 51, fig. 7) or by Evermann and Radcliffe (1917, p. 31), one of whose specimens is at hand); gill rakers short, 3 on upper and 10 on lower limb of first arch in one specimen; upper surface of head smooth, fontanel produced forward as a deep groove sometimes nearly to posterior margin of eye; occipital plate narrow; origin of dorsal about length of snout behind base of pectoral spine, distance anterior to dorsal 2.6 to 2.7 in length; dorsal spine slender, without definite barbs, 1.35 in head; adipose fin large, its origin over or a little in advance of that of anal, its base 2.5 to 2.8 in head; caudal fin long, deeply forked, the upper lobe the longer; anal fin with rather deeply concave margin, the anterior rays reaching well beyond tip of posterior one if deflexed, its base 2.0 to 2.25 in head; ventral rather large, reaching origin of anal, inserted about equidistant from base of pectoral spine and middle of base of anal; pectoral failing to reach base of ventral by about length of snout, the spine distinctly barbed distally on outer margin, 1.4 to 1.8 in head.

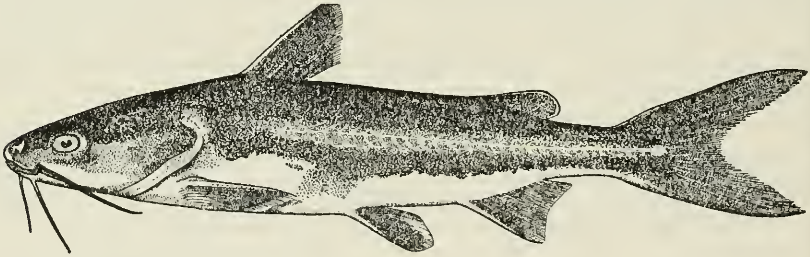

FIGURE 26.—*Galeichthys peruvianus* Lütken. From a specimen 350 mm. long, Callao, Peru (U.S.N.M. No. 77693). (After Evermann and Radcliffe, 1917.)

Color of preserved specimens blackish above, pale silvery underneath, middle of side with a silvery to slightly reddish band about as wide as eye, becoming obscure anteriorly; fins mostly blackish, the pectoral with pale inner margin, the dark middle rays of ventral with pale margins, posterior half or so of anal pale.

The Mission secured two specimens, 285 and 325 mm. (223 to 245 mm. to base of caudal) long, both taken in a trammel net off Isla

Santa, near Chimbote. A third specimen (U.S.N.M. No. 77693), 350 mm. (273 mm. to base of caudal) long, taken at Callao by R. E. Coker, also is at hand and is included in the proportions given. This catfish is readily recognized by the reddish silvery lateral band.

Range.—Altata, Sinaloa, Mexico; Panama Bay; and Peru. Reported as abundant on the coast of Peru by Steindachner (1875, p. 34).

GALEICHTHYS JORDANI (Eigenmann and Eigenmann)

BAGRE

FIGURE 27

?*Arius platypogon* STEINDACHNER (probably not of Günther), 1875b, p. 17, Callao, Peru (description).

Tachysurus jordani EIGENMANN and EIGENMANN, 1888, p. 142, Panama Bay (original description); 1890, p. 79, fig. 27 (teeth), Panama Bay (description).

Galeichthys simonsi STARKS, 1906, p. 764, figs. 1 and 2, Callao, Peru (original description; compared with *G. jordani*).—EVERMANN and RADCLIFFE, 1917, p. 31, Tumbes and Capón, Peru (description).

Galeichthys seemanni MEEK and HILDEBRAND, in part, 1923, p. 107 (*G. simonsi*, which is *G. jordani* incorrectly synonymized; description).

Tachysurus seemanni FOWLER, in part, 1941a, p. 369 (references).

Head 3.25 to 3.6; depth 4.2 to 4.4; D. I, 7; A. 17 to 19; P. I, 9 or 10.

Body rather robust, its depth exceeding its width at origin of dorsal by a half to a whole diameter of eye, tapering posteriorly; caudal peduncle rather strongly compressed, its depth 3.25 to 3.55 in head; head not especially broad, its greatest width slightly exceeding its length without snout; interorbital space quite flat, 2.0 to 2.05 in head; snout not strongly depressed, its sides nearly vertical, very broadly rounded anteriorly, 2.6 to 2.7 in head; eye large, elongate, lateral, 5.75 to 6.25; mouth broad, arched forward gently, its width at angles 2.5 to 2.7; teeth quite pointed, the band on upper jaw (premaxillary) not extending quite to angles of mouth, continuous, the band on lower jaw narrower, and reaching farther back, well separated on median line; vomerine and palatine teeth less sharply pointed, vomerine patches well separated on median line in some specimens, rather close together in others, scarcely separated from the much larger palatine patches; gill rakers scarcely half length of eye, 5 or 6 on upper limb and 10 or 11 on the lower one of first arch; upper surface of head often rather smooth, sometimes granular, no ridges; fontanel groove generally extending forward to opposite posterior margin of eye, and backward nearly but not quite to occipital plate; this plate fully as broad as long, with a sharp median keel; origin of dorsal about length of snout behind base of pectoral spine; distance anterior to origin of dorsal 2.5 to 2.8 in length; dorsal spine only slightly rough on anterior margin, its posterior margin with small barbs, failing by diameter of eye to reach tips of longest soft rays, 1.3 to 1.6 in head; adipose moderately large, beginning a little behind vertical from origin of anal, its base 3.4 to 3.6 in head; caudal moderately forked, the upper lobe much longer and more sharply pointed than the lower one; anal with concave margin, its base 1.75 to 2.0 in head; ventral failing to reach origin of anal in male, somewhat beyond origin in large females and with thick integument on inner surface, inserted rather nearer middle of base of anal than base of pectoral spine; pectoral failing to reach ventral by at least twice diameter of eye, the spine rough on outer margin, and barbed on inner margin, rougher in male than female, failing to reach tip of longest soft rays by diameter of eye, 1.5 to 1.75 in head.

Color of rather recently preserved specimens metallic blue above, shading into silvery on side; pale underneath; fins more or less dusky, inner surfaces of pectoral and ventral black, becoming pale distally; caudal with a very narrow black margin.

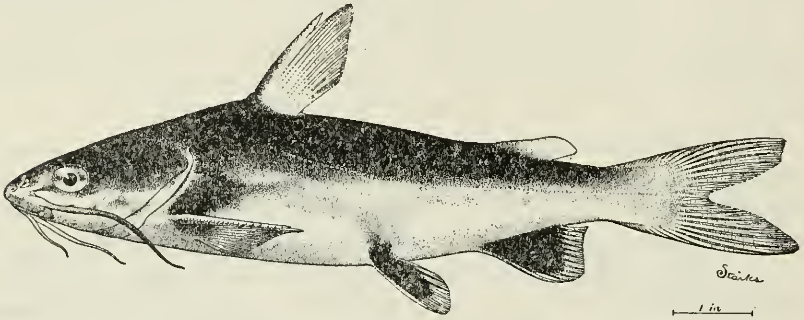

FIGURE 27.—*Galeichthys jordani* (Eigenmann and Eigenmann). From the type of *G. simonsi* Starks, 255 mm. long, Callao, Peru (U.S.N.M. No. 53466). (After Starks, 1906.)

Two females, 290 and 340 mm. (230 and 262 mm. to base of caudal) long, were taken in the harbor at Cabo Blanco by the Mission. One was caught with a hand line and the other in a trammel net. In addition, the type of *G. simonsi* (U.S.N.M. No. 53466), 255 mm. (208 mm. to base of caudal) long, from Callao, and one specimen (U.S.N.M. No. 77735), about 335 mm. (256 mm. to base of caudal) long, taken by R. E. Coker at Tumbes, were measured. The foregoing description is based on the four specimens mentioned. Several small specimens (U.S.N.M. No. 77580) taken at Capón by R. E. Coker and one (U.S.N.M. No. 101842) secured at Callao by W. L. Schmitt also were examined. The Peruvian material was compared with specimens from Panama, and it was learned thereby that the Peruvian specimens are identical with *G. jordani*, rather than with *G. seemanni*, with which *G. simonsi*, based on a Peruvian specimen, had been synonymized by several authors. *G. jordani*, which is rather closely related to *G. seemanni*, is characterized by the large eye; the rather flat deep snout with nearly vertical edges; the smooth flat interorbital, which rises scarcely more than diameter of pupil above upper margin of eye; and the broad mouth, which is arched forward only slightly.

Range.—Panama Bay to Peru.

Genus ARIUS [5] Cuvier and Valenciennes, 1840

Arius may be recognized by the absence of teeth on the vomer and by the rather broad patches of moderately blunt teeth on the palatines, which do not have backward projections.

A single species, characterized by its numerous anal rays, comes within the scope of the present work.

ARIUS MULTIRADIATUS Günther

BAGRE

FIGURE 28

Arius multiradiatus GÜNTHER, 1864, p. 173 (brief diagnosis, after Kner and Steindachner).—MEEK and HILDEBRAND, 1923, p. 123, Panama Bay (synonymy; description).

Bagrus arioides KNER and STEINDACHNER (not of Cuvier and Valenciennes) 1865, p. 47, Río Bayano, Pacific slope of Panama (indicated as new with an interrogation point and without showing that *B. arioides* is of Cuvier and Valenciennes, 1839, p. 440; description).

Tachysurus equatorialis STARKS, 1906, p. 766, figs. 3, 4, Guayaquil, Ecuador (original description).—EVERMANN and RADCLIFFE, 1917, p. 32, Paita, Peru (description).

Tachysurus fürthii FOWLER, 1941a, p. 370 (references; only those pertaining to *T. equatorialis* are certainly this species).

Head 3.5 to 3.75; depth 4.7 to 5.2; D. I, 7; A. 25 to 27; P. I. 10.

Body notably deeper than broad at origin of dorsal, tapering moderately posteriorly; caudal peduncle strongly compressed, its depth 2.8 to 3.3 in head; head moderately broad, its greatest width about equal to its length less half the snout; interorbital space 2.0 to 2.8 in head; snout broadly rounded, 2.75 to 2.9; eye lateral, 5.0 to 6.2; mouth arched forward broadly, its width at angles 2.6 to 2.9; teeth in jaws pointed, in moderately broad bands; palatine teeth rather blunt, in a short band, tapering but not pointed posteriorly; gill rakers scarcely longer than pupil, 5 or 6 on upper and 13 or 14 on lower limb of first arch; upper surface of head rather rough, without distinct ridges; fontanel failing to reach occipital process by about half diameter of eye, extending forward somewhat beyond posterior rim of orbit, closed between eye, and reappearing as an elongate pit on snout; occipital plate anteriorly broad, its width somewhat exceeding its length; origin of dorsal full length of snout behind base of pectoral spine, distance anterior to origin of dorsal 2.5 to 2.75 in length; dorsal spine long, slender, rough on anterior margin, posterior margin with small barbs, not extending to tip of soft rays, 1.15 (in adults) to 2.0 (in young) in head; adipose fin moderately large, its origin over about the beginning of the second third of anal, its base 2.25 to 3.0 in head; caudal moderately forked, the upper lobe longer and narrower than the lower; anal with slightly concave margin in adult, rounded in young, its base 1.25 to 1.33 in head; ventral rather small, not quite reaching origin of anal, inserted rather nearer base of pectoral spine than middle of base of anal; pectoral failing to reach ventral by about diameter of eye, the spine rough on outer margin, with small barbs on inner margin 1.3 to 1.75 in head.

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[5] I am using *Arius* with the knowledge that several authors have considered *Tachysurus*, which is an older name, as available. However, as *Tachysurus sinensis*, the type of the genus, was based on a painting of a fish from fresh water of China, it seems highly improbable that it is the same as *Arius* as herein defined. Furthermore, modern classification of the catfishes is based in large part on the character of the teeth, which of course could not be determined from a painting of the exterior. For a rather detailed discussion of this matter see Regan (1907, p. 125, footnote).

Color dark blue above, becoming silvery on lower part of side, and pale silvery underneath; fins mostly pale with dusky punctulations.

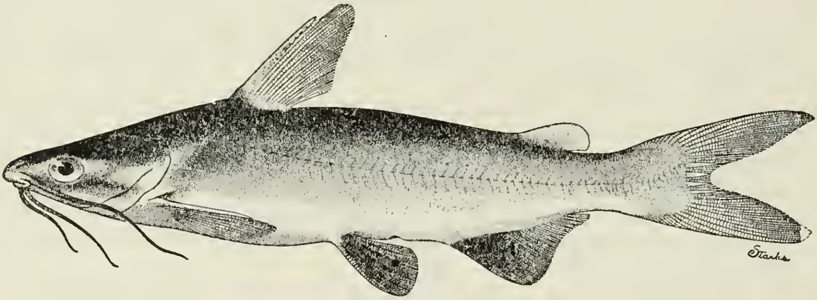

Figure 28.—*Arius multiradiatus* Günther. From the type of *Tachysurus equatorialis* Starks, 193 mm. long, Guayaquil, Ecuador (U.S.N.M. No. 53470). (After Starks, 1906.)

The Mission obtained 3 specimens, 57, 58, and 147 mm. (46, 46, and 117 mm. to base of caudal) long, all from the Gulf of Guayaquil, off Puerto Pizarro. One of the specimens (U.S.N.M. No. 77596), 185 mm. long, obtained by R. E. Coker at Paita, upon which the account by Evermann and Radcliffe (1917, p. 32) of *Tachysurus equatorialis* was based, also is at hand. The foregoing description is based on the four specimens listed. These were compared with specimens from Panama, identified as *A. multiradiatus*, and with the type (U.S.N.M. No. 53470) of *Tachysurus equatorialis* with which they agree perfectly. Fowler (1941a, p. 370) apparently mistakenly synonymized *T. equatorialis* Starks with *Arius fürthii* Steindachner. The last-mentioned species was originally described from "Panama" (presumably meaning Panama City). The number of anal rays was given as 20 to 22. Specimens from Panama Bay, having that number of anal rays, also have fewer gill rakers (9 to 11 on lower limb of first arch), and the palatine teeth are blunter and in larger patches, therefore representing a different species.

Range.—Panama Bay to Paita, Peru.

Family MURAENIDAE[6]: Morays

Body moderately robust,[7] scaleless; skin thick, leathery, extending on the fins; head conic; mouth large; tongue wanting; teeth strong, sharp or blunt; gill opening small, lateral, sometimes roundish; dorsal and anal fins confluent around the tail; pectoral fins wanting.

Three genera from Peru are recognized herein.

Steindachner (1869c, pp. 27, 28) described *Leptocephalus multimaculatus* and *L. peruanus* from the Peruvian coast. The descriptions are based on larvae, "Leptocephaliden," and accordingly were placed in the genus *Leptocephalus*, as was customary at that time. It is quite impossible to determine whether the leptocephali, known to me only from the original descriptions, are the young of any species of which the adults have been described, or to which family they belong. Descriptions condensed from the original ones follow:

1. *Leptocephalus multimaculatus.*—Related to *L. longirostris* Kaup in the shape of the body and the dentition in the jaws, but the body is decidedly slenderer, its greatest depth being 3⅓ lines at a total length of "3″ 1″ ′"(presumably meaning $3\frac{1}{12}$ inches); head about 18½ times in total length; snout half length of lower jaw, the latter half as long as head; gape oblique, extending to beyond middle of the fairly large eye; both jaws pointed, the lower one slightly the longer, very small, soft and transparent, anteriorly with eight or nine teeth visible with the naked eye, directed forward, followed by six to eight minute teeth posteriorly; upper jaw with seven similarly large teeth, directed forward and six to eight minute teeth under the eye; pectorals wanting; only on the posterior part of the back and ventral margins are present a trace of rays. Behind the head lie nine blackish flecks, along the ventral margin; then follow six on the midline of the trunk. Total length of one example is 3″ 1″ ′; greatest height of head 3⅓″ ′; length of head 2″ ′; length of snout ½″ ′; length of mandible 1″ ′; diameter of eye ⅖″ ′ (the accents apply to inches and lines, the total length of the specimen being $3\frac{1}{12}$ inches).

2. *Leptocephalus peruanus.*—The body is very deep, ribbon-shaped, deepest at midlength, decreasing evenly in both directions, both ends of body pointed, the greatest depth being about a fourth of the total length; head and teeth about as in *L. multimaculatus;* head one-twelfth of the total length. A dark fleck is present on the ventral margin shortly behind midbody length. We have two examples of this pretty species which are 1″ 5½″ ′ long; head 1½″ ′ long; head 1½″ ′ long; depth 4½″ ′, eye ½″ ′ (the accents apply to inches and lines, the total length of the specimens being $1\frac{5.5}{12}$ inches).

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[6] This family name is used with knowledge of Fowler's findings (Bull. Amer. Mus. Nat. Hist., vol. 70, pt. 1, p. 261, 1936), the discussion offered by Myers and Wade (Allan Hancock Pacific Expeditions, vol. 9, No. 4, p. 87, 1941), and that by Schultz (U. S. Nat. Mus. Bull. 180, p. 11, 1943).

[7] Proportions of depth of body given in the descriptions are not accurate, as some specimens were pressed out of shape in the process of preserving and others were more or less shriveled.

KEY TO THE GENERA

a. Teeth in the jaws all pointed, not serrate.
  b. Anterior nostril only in a tube, the posterior one general surrounded by a slightly raised membrane ---------------------- **Gymnothorax** (p. 130)
  bb. Both pairs of nostrils provided with tubes -------------- **Muraena** (p. 131)
aa. Teeth in the jaws compressed, serrate, sharklike, in a single series. **Priodonophis** (p. 133)

Genus GYMNOTHORAX Bloch, 1795

Body more or less compressed; anterior nostril only in a tube, the posterior one generally surrounded by a slightly raised membrane, situated over or somewhat behind anterior margin of orbit; teeth pointed, not serrulate, often in two series in jaws, usually in a single series on shaft of vomer, the anterior teeth in both jaws and on vomer enlarged; gill opening small, lateral, nearly horizontal; dorsal and anal confluent around the tail, origin of dorsal in advance of gill opening; pectorals wanting.

A single species, as here understood, comes within the scope of this work.

GYMNOTHORAX WIENERI Sauvage

MORENA; MORENA COLORADA

FIGURE 29

Gymnothorax wieneri SAUVAGE, 1883, p. 161, "Chile au Peru" (original description).—EVERMANN and RADCLIFFE, 1917, p. 26, pl. 3, fig. 3, Lobos de Afuera and Callao, Peru (description).—NICHOLS and MURPHY, 1922, p. 505, Lobos de Tierra Island and Pacasmayo, Peru (3 specimens listed).—FOWLER, 1941a, p. 366 (references).

Body fairly compressed, thickness at vent about half depth at same place, the tail strongly compressed, terminating rather broadly, length anterior to vent 2.0, 1.85 in total length; head compressed, its length anterior to gill opening 8.0, 6.6 in total length, 4.3, 3.7 in length anterior to vent; depth about 7.5, 5.2 in length anterior to vent, 1.75, 1.5 in head; snout robust, rectangular in cross section, being deeper than wide, 5.2, 5.0 in head; eye small, lateral 14.7, 17 in head, 2.8, 3.4 in snout; mouth large, horizontal, terminal, the gape extending far beyond eye, 2.25, 2.2 in head; teeth in the jaws in two series, those of the outer series very small, and missing posteriorly, those of the inner series large anteriorly, becoming progressively smaller posteriorly; vomer anteriorly with a pair of large teeth, followed by two larger single ones and a series of very short blunt teeth on the shaft; palatines each with three large teeth (teeth of a smaller specimen as in the larger one described, except that the vomer has only two large single teeth anteriorly); anterior nostril with a short tube, situated well above lip, near tip of snout, the posterior one surrounded by a rather narrow raised membrane, situated over anterior margin of orbit; gill opening nearly horizontal; about as long as eye; vertical fins with heavy skin, confluent around the broad, strongly compressed tail, origin of dorsal over nape, distance anterior to its origin 4.9, 4.2 in length anterior to vent, 1.6, 1.2, in head.

Color of old preserved specimens dark brown, somewhat lighter underneath; obscurely marbled with darker and lighter colors. "Color in life: Entire body and head, dirty brown, mottled." (Evermann and Radcliffe, 1917, p. 27.)

This eel was not secured by the Mission. It is here described from two specimens, 400 and 790 mm. long, collected at Lobos de Afuera, by R. E. Coker who, according to Evermann and Radcliffe (1917, p. 26), also took a specimen at Callao, which is not now at hand. It has also been reported from Lobos de Tierra Island and from Pacasmayo (Nichols and Murphy, 1922, p. 505). The larger specimen at hand has a much more robust body than the smaller one and differs in other proportions, as shown in the description in which the proportions based on the smaller specimens are given first in each instance. The differences are thought to be attributable to variation in age and size.

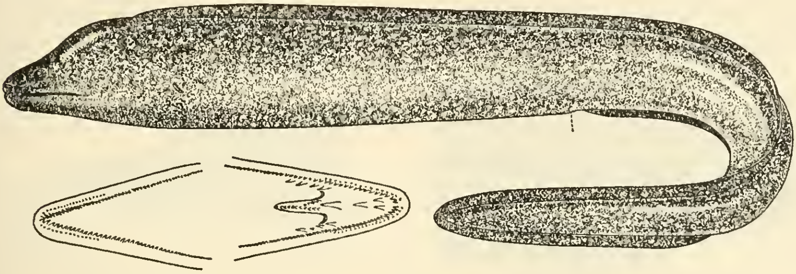

FIGURE 29.—*Gymnothorax wieneri* Sauvage. From a specimen 790 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 77680). Insert, mouth spread open showing the teeth. (After Evermann and Radcliffe, 1917.)

This eel is mentioned in the report of the Mission (1943, p. 279) as of limited economic importance. Although it is stated that "a number of these were caught at Lobos de Afuera in shallow, rocky areas," no specimens in the collection were recognized as this species.

Range.—Coast of Peru. The type was thought to be either from Chile or Peru. There appears to be no definite Chilean record.

Genus MURAENA Linnaeus, 1758

This genus differs from *Gymnothorax* and other genera of the family in having both the anterior and posterior nostrils provided with prominent tubes; teeth all pointed.

A single species, which seems to be new, comes within the scope of the present work.

MURAENA ALBIGUTTA, new species

MURAENA; MORENA

FIGURE 30

Body compressed, thickness at vent about two-thirds depth at same place; tail rather strongly compressed, tapering to a rather sharp point; length anterior to vent 2.1, 2.3 in total length; head moderately compressed, its length anterior to gill opening 7.7, 7.25 in total length, 3.6, 3.1 in length anterior to vent; depth 6.0, 5.2 in length anterior to vent, 1.65, 1.65 in head; snout fairly robust, nearly square in cross section, 5.4, 5.8 in head; eye rather large, lateral, 9.0, 9.4 in head, 1.75, 1.55 in snout; mouth moderately large, not quite terminal, the snout projecting slightly, the gape reaching well beyond eye, 2.25, 2.6 in head; teeth in a single row in each jaw in the larger specimen at hand, double for a short distance at midlength in the upper jaw of the smaller one; vomer anteriorly with two large, fanglike, single depressible teeth and four small ones on shaft; tube of anterior nostril about three-fourths length of eye, reaching well beyond margin of lip if drawn forward and downward, second nostril over anterior part of eye, its tube about three-fourths length of that of anterior one; gill opening not quite horizontal, a little shorter than snout; vertical fins rather broadly confluent around the tail; origin of dorsal over nape, higher than the anal; distance anterior to dorsal 4.35, 4.0 in length anterior to vent.

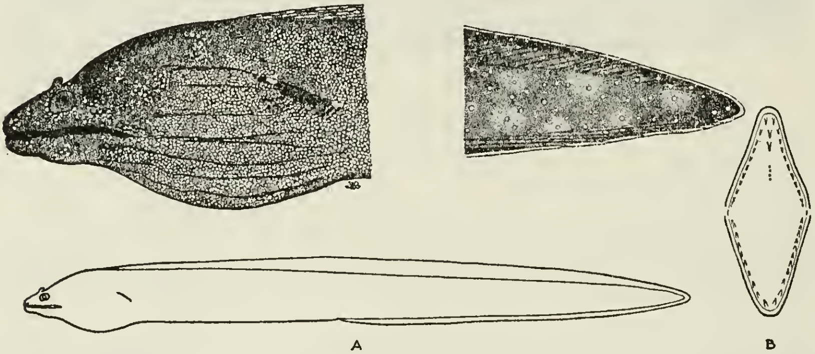

FIGURE 30.—*Muraena albigutta*, new species. From the type, 575 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 127840). Inserts: *A*, Diagram showing shape and proportions; *B*, mouth spread open showing the teeth.

Color of the larger preserved specimen grayish, speckled almost everywhere with white dots, extending on fins, smallest on head and largest on distal part of tail, none larger than pupil of eye, those on tail more or less distinctly surrounded by dark rings; pale blotches present almost everywhere except on head; angle of mouth black, not preceded by a pale spot on mandible; furrows of skin folds on lower parts of head conspicuously black; gill opening with an elongate black blotch below, its upper margin only a little darker than surrounding parts, not ringed with white, though with enlarged pale spots fore and aft; dorsal and anal distally and around tail with conspicuous white margin, becoming broken and spotted farther forward. The smaller specimen with obscure pale blotches, with rather larger and more conspicuous round, white spots, more distinctly ringed with black; otherwise as in the larger one.

The Mission secured two specimens, 575 and 325 mm. long, of this apparently new eel. The larger one, designated as the type (U.S.N.M. No. 127840), was taken at Lobos de Afuera Island with a hand line; the smaller one in Lobos de Afuera Bay. The proportions given first pertain to the type.

This is the fifth species of this genus recognized from the tropical Pacific coast of America. It seems to differ from all the others in having a larger eye, shorter snout, and a rather smaller mouth, as well as in color. It probably is nearest to *M. insularum* Jordan and Davis, known from the Galápagos Islands, of which a specimen is before me (U.S.N.M. No. 107048). In the Galápagos specimen the gape is contained 2.1, the snout 4.9, and the eye 13.4 times in the head, and the eye 2.75 in the snout. The tube of the anterior nostril is shorter, failing to reach the margin of the lip if drawn forward and downward, and the posterior nostril is farther forward, being almost wholly in advance of anterior margin of eye. The Galápagos specimen also is much darker in color, being very dark brown and without large pale blotches, but with reticulations on the head and small irregular pale markings on body, and fewer pale spots on the sides, none of which are ringed with black. Unlike *M. albigutta*, the black in the angle of the mouth is preceded by a prominent pale spot on the lower jaw, and the margins of the fins are not white or pale spotted as in *M. albigutta*. The name *albigutta* is in allusion to the white or pale dots on the body.

Range.—Only the type from Lobos de Afuera Island and a paratype from Lobos de Afuera Bay are known.

Genus PRIODONOPHIS Kaup, 1860

This genus differs from *Gymnothorax* chiefly in having *compressed, serrated, sharklike teeth,* in a single series in each jaw,[8] small ones present or absent on vomer. *Priodonophis,* which has *Gymnothorax ocellatus* Agassiz as genotype, has long been considered as of only subgeneric rank. However, the serrated, sharklike teeth in the jaws seem to justify its recognition as a separate and distinct genus.

A single species, which appears to be new, comes within the scope of the present work.

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[8] The new species herein described has a few to several depressible teeth in an inner series on one or both sides of the lower jaw, while those in upper jaw are in a single series throughout.

PRIODONOPHIS EQUATORIALIS, new species

MORENA; ANGUILA

FIGURE 31

Body compressed, thickness at vent not much greater than half depth at same place; tail strongly compressed, tapering to a rather narrow point; length anterior to vent 2.25, 2.1 in total length; head moderately compressed, its length anterior to gill opening 7.4, 6.9 in total length, 3.3, 3.25 in length anterior to vent; depth 6.25, 5.7 in length anterior to vent, 1.9, 1.75 in head; snout robust, almost square in cross section, 6.25, 6.3 in head; eye moderately large, lateral, 9.8, 11.0 in head; 1.6, 1.8 in snout, mouth large horizontal, terminal, the gape extending far beyond eye, 2.8, 2.8 in head; lips plicate on inner side; snout and mandible with prominent pores; teeth in each jaw in a single series (or the lower jaw with a few to several depressible teeth in an inner series on one or both sides), moderately large anteriorly, becoming quite small posteriorly, compressed, with definite serrations on both margins, quite sharklike, none on vomer or palatines; anterior nostril with a rather prominent tube, situated nearer dorsal outline of snout than margin of lip, the posterior one large, oval, surrounded by a slightly raised membrane (a large elongate slit on one side in the larger specimen, at hand, being abnormal), situated above anterior part of eye; gill opening quite oblique, about as long as the large eye; vertical fins not with especially thick skin, narrowly confluent around the slender tail, the dorsal rather high over most of the caudal portion of body, originating well in advance of gill opening, distance anterior to its origin 4.1, 4.1 in length anterior to vent, 1.25, 1.25 in head.

Color of preserved specimens dark brown, the fins darker than the body; body with comparatively few scattered pale dots in the smaller specimen at hand, profusely dotted in the larger one; the dots extending on the fins, but not on the ventral surface of head and trunk; pale dots minute on head, becoming larger posteriorly, especially on distal part of the slender tail.

Two specimens, 625 and 795 mm. long, were taken by the Mission on August 15, 1941, with a line trawl, in about 12 fathoms, in the Gulf of Guayaquil, near Cabo Blanco. The smaller specimen is a gravid female. Although the two specimens are somewhat dissimilar in color and differ to some extent in some of the proportions, as shown in the description in which the proportions pertaining to the smaller specimen in each instance are given first, the two undoubtedly are of the same species. The larger one (U.S.N.M. No. 127842), though somewhat abnormal as to its right posterior nostril, is designated as type.

This species is very close to *P. ocellatus* (Agassiz), ranging on the Atlantic coast from North Carolina presumably to Uruguay. Upon comparison of several specimens from North Carolina and from

Florida only the following differences were noticed: The snout projects slightly and is rather longer in the Atlantic specimens, being contained 5.1 to 5.4 in the head, whereas it is coterminal with the mandible in the Peruvian ones and is contained 6.25 and 6.3 in the head; the gape apparently is longer in the Atlantic species, being contained in the head 2.15 times if measured from the tip of snout, compared with 2.8 in the Peruvian ones; the teeth are proportionately longer, slenderer, and less sharklike in the Atlantic specimens, with finer serrations, especially on anterior margins, and the vomer has small teeth on the shaft in all the specimens examined, which the Peruvian specimens do not possess.

Range.—Only the type material, two specimens from the Gulf of Guayaquil, taken near Cabo Blanco, Peru, is known.

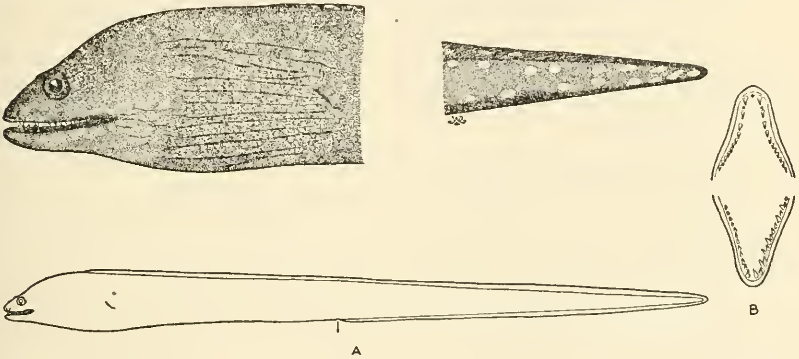

FIGURE 31.—*Priodonophis equatorialis*, new species. From the type, 795 mm. long, Cabo Blanco, Peru (U.S.N.M. No. 127842). Inserts: *A*, Diagram showing shape and proportions; *B*, mouth spread open, showing teeth.

Family OPHICHTHYIDAE: Snake Eels

Body slender,[9] scaleless; mouth large,[10] horizontal; tongue present, usually adnate to floor of mouth; anterior nostril in upper lip, with a tube directed downward; gill openings lateral or subinferior, well separated; tail extending beyond dorsal and anal fins, usually ending in a rather sharp horny point.

A single genus comes within the scope of the present work.

Genus OPHICHTHUS Ahl, 1787

Body cylindrical or subcylindrical; snout moderately pointed, generally projecting beyond mandible; eye small, in anterior third of head; mouth large, the cleft extending below or beyond eye; teeth acute or conic, no special canines, in one or more series in jaws and on vomer;

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[9] Proportions of depth of body given in descriptions are not accurate, as some specimens became distorted in the process of preservation and others shriveled.

[10] Proportions in the descriptions pertaining to the size of the mouth or gape are based on the distance from the tip of the snout to the angle of the mouth.

anterior nostril in more or less of a tube, on edge of snout; posterior nostril a slit in upper lip; gill opening a slit before and below pectoral; no scales; lateral line present; dorsal long, low, its origin over or more usually behind gill opening, ending a short distance in front of tip of tail.

Five species have been recognized in the collections studied. According to the report of the Mission (1943, p. 288) the species of this genus are of limited commercial importance in Peru. Landings were reported from Talara, Negritos, and Paita.

KEY TO THE SPECIES

a. Body with large black spots on back and at least on upper part of side.
  b. Teeth in two series in each jaw; tail notably longer than head and trunk; pectoral fin much longer than snout, 2.7 to 3.0 in head.
    c. Head large, 8.9 in total length; eye about half length of snout, 10.5 in head; no papilla on upper lip between nostrils; inner row of teeth in lower jaw discontinued posterior to about midlength of jaw__ **triserialis** (p. 136)
    cc. Head smaller, 9.7 in total length; eye nearly as long as snout, 6.3 in head; a prominent papilla on upper lip between nostrils; inner row of teeth complete______________________________ **grandimaculata** (p. 138)
  bb. Teeth in two series in upper jaw, in a single series in lower jaw; tail scarcely longer than head and body; pectoral fin about as long as snout, 6.7 in head__________________________________**afuerae**, new species (p. 139)
aa. Body not spotted with black, plain or with small pale dots.
  d. Head large, depressed, broader than deep at posterior angle of mouth, 6.9 to 7.4 in total length, 2.9 to 3.1 in length anterior to vent; teeth in lower jaw in two complete series, sometimes with a few small teeth in a third series____ **pacifici** (p. 141)
  dd. Head smaller, compressed, somewhat deeper than broad at posterior angle of mouth, 7.5 to 8.5 in total length, 3.1 to 3.4 in length anterior to vent; teeth in lower jaw in two series anteriorly, the inner series discontinued posterior to about midlength of jaw________________ **callaensis** (p. 142)

OPHICHTHUS TRISERIALIS (Kaup)

Muraenops triserialis KAUP, 1856a, p. 12, "Pacific" (original description).

Ophisurus californiensis GARRETT, 1863, p. 66, Baja California (original description).

Ophichthus rugifer JORDAN and BOLLMAN, 1890, p. 155, Charles Island, Galápagos (original description; compared with *O. triserialis*).

Ophichthus triserialis MEEK and HILDEBRAND, 1923, p. 155 (synonymy; description).

Body moderately robust, subcylindrical; head and trunk notably shorter than tail, length anterior to vent 2.4 in total length; head somewhat deeper than broad at posterior angle of mouth, its length anterior to gill opening 8.9 in total length, 3.7 in length anterior to vent; depth 7.5 in length anterior to vent, 1.95 in head; snout rather short, moderately blunt, extending beyond mandible a distance about equal to pupil, 4.9 in head; eye small, lateral, 10.5 in head, 2.15 in snout; mouth moderate, the gape reaching far beyond eye, 2.5 in head; teeth quite small, some apparently worn down, others broken or missing, directed backward; each jaw with two series laterally, the upper jaw anteriorly with three teeth on each side, the row interrupted, but resumed behind first nostril as the inner row, the outer row beginning under second nostril, the inner series in lower jaw being discontinued at about midlength of jaw; vomer apparently with two pairs of teeth (one tooth missing) in front, followed by eight teeth in a single median row; anterior nostril with a rather prominent tube, provided distally with a pointed flap; posterior nostril with a rather broad fringed border on both the outer and inner sides; no papilla and no evident pore in the lip between the nostrils; gill opening large, rather longer than snout, and equal to distance between the two openings ventrally; dorsal fin in a groove, its origin about over beginning of distal fourth of pectoral, the distance anterior to its origin 2.9 in length anterior to vent; anal similar to dorsal; pectoral rather long, nearly as long as gape, 3.0 in head.

Color dark brown, with indefinite large black spots on back and upper part of side, becoming more distinct posteriorly; small dark spots of various sizes on head; the large spots consisting principally of two rows, one on the middle of the back and the other on upper part of side; a few spots of a third row evident on the trunk below the lateral line. The row of spots on the middle of back divided by the median dorsal groove, the halves more or less halfmoon-shaped, and not always directly opposite each other; the spots of the second series larger, alternating with those on the back, occupying the space between the dorsal fin and the lateral line; dorsal fin with a continuous black margin and with an occasional submarginal elongate black spot; anal dark brown, the margin rather darker than rest of fin; pectoral dark brown, darker distally than at base, with a suggestion of two dark spots near base.

A single specimen, 920 mm. long, taken by the Mission in Sechura Bay with a hand line, forms the basis for the foregoing description. This specimen has been compared with two smaller ones, 705 and 800 mm. long, from Baja California. Several differences were noticed, which, however, may not be of specific importance. The Peruvian specimen is stockier, which may be only the result of greater age, and it is much darker in color, though in general the arrangement of the spots is nearly the same. The head at the posterior angle of the mouth is notably deeper than wide in the Peruvian fish, whereas the depth and width at the same place are about equal in the others. In the large Peruvian specimen the gill opening is rather longer than the snout and equal to the distance between the openings ventrally, whereas in the California specimens the gill opening is notably shorter than the snout and also shorter than the space between the opposite openings. The eye in the Peruvian fish is smaller, being contained 2.15 times in the snout, and only 1.7 times in the California specimens. The posterior nostril has a raised indented membrane in the former, which has smooth edges in the latter; and finally the Peruvian specimen has no papilla on the lip between the nostrils and no evident pore, whereas the California specimens have a prominent papilla with a large pore at its base. The arrangement of the teeth is about the same in all the specimens. However, the teeth are fewer and blunter (perhaps worn) in the Peruvian eel, and the inner row in the lower jaw is incomplete.

The type of *O. rugifer* also has been compared with the Peruvian and Baja California specimens and apparently is *O. triserialis*. It is in rather close agreement with the specimens from Baja California.

Range.—Southern California to northern Peru and the Galápagos Islands. Also recorded from the tropical Atlantic.

OPHICHTHUS GRANDIMACULATA (Kner and Steindachner)

ANGUILA

Ophichthys grandimaculata Kner and Steindachner, 1866, p. 389, pl. 5, fig. 13, coast of Peru (original description).—Günther, 1870, p. 58, Peru (description, based on one of the type specimens, 24 inches long).

Ophichthus grandimaculatus Abbott, 1899, p. 332 (reference).—Evermann and Radcliffe, 1917, p. 24, Lobos de Tierra, Peru (references; description).—Fowler, 1941a, p. 364 (references).

Body rather slender, snakelike, somewhat deeper than broad; head and trunk considerably shorter than tail, length anterior to vent 2.45 in total length; head compressed, its length anterior to gill opening 9.7 in total length, 4.0 in length anterior to vent; depth 8.8 in length anterior to vent, 2.2 in head; snout fairly pointed, extending somewhat beyond mandible, 5.8 in head; eye lateral, 6.3 in head, 1.1 in snout; mouth large, the gape reaching well beyond the eye, 2.8 in head; teeth all pointed and directed backward, biserial laterally in both jaws, upper jaw with 1 or 2 anteriorly on each side, the inner row laterally beginning between the two nostrils, the outer row behind second nostril, both rows continued to angle of mouth, vomer with two pairs of teeth anteriorly, followed by a single row of 12 teeth, becoming progressively smaller posteriorly; anterior nostril with a well-developed tube, the posterior one without a tube but with a well-raised membranous border; upper lip bilobed at tip and with a well-developed papilla between the nostrils; gill opening nearly vertical, about as long as snout; dorsal low, in a groove, its origin about over midlength of pectoral, length anterior to its origin 3.0 in length anterior to vent, extending within an eye's diameter to tip of tail; anal fin similar to dorsal and coterminal with it; pectoral rather long and narrow, 2.7 in head, 10.7 in length anterior to vent.

Color of preserved specimen light brown, with large black spots on body and tail, and numerous small ones on head; a row of black spots on the back, more or less halfmoon-shaped, being divided on the median line by the dorsal groove, the halves sometimes not quite opposite each other, a half sometimes missing; a row of large spots on upper half of side, alternating with those on the back and extending to or more usually slightly below the lateral line; a third series of dark spots smaller and less distinct on lower part of side extending backward on anterior fourth of tail; posterior half of tail with a median ventral series of dark spots; dorsal fin with a black margin between the dark spots, elsewhere mostly pale; anal brownish; pectoral largely brown.

The description is based on a single specimen, 370 mm. long (U.S.N.M. No. 77635), secured by R. E. Coker at Lobos de Tierra. This is the eel on which the account by Evermann and Radcliffe (see reference above) was based. This specimen seems to agree well with the type specimens as described, except for cross bands on the back, which are not well marked, though the spots described do suggest bars. The specimen at hand is much smaller than the type specimen described as having cross bands by Günther (see reference above), which was 600 mm. long. Some variation in color with age may be expected.

Range.—Coast of Peru.

OPHICHTHUS AFUERAE, new species

FIGURE 32

Body slender, scarcely deeper than broad; head and trunk about equal in length to the tail, the length anterior to vent 2.07 in total length; head large, scarcely deeper than broad at posterior angle of mouth, its length anterior to gill opening 8.2 in total length, 3.9 in length anterior to vent; depth 9.8 in length anterior to vent, 2.5 in head; snout rather broad, scarcely extending beyond mandible, 6.6 in head; eye lateral, 6.7 in head, 1.5 in snout; mouth large, the gape reaching far beyond eye, 2.2 in head; teeth pointed, directed backward; upper jaw with two rows laterally, with a single row of six teeth anteriorly, the row interrupted, but resumed posterior to first nostril, the second (outer row) beginning behind second nostril, both rows extending nearly to angle of mouth; lower jaw with a single row; vomer with a pair of teeth anteriorly followed by a single row of 10 teeth becoming progressively smaller posteriorly; anterior nostril with a well-developed tube, the second one without a tube but with a broad fringed membrane on outer side and none on inner side, the membrane being within the mouth; upper lip more or less papillose, with a prominent barbel-like papilla on outside of second nostril, proceded by a prominent pore, and 3 more or less evenly spaced pores behind it; gill opening mostly lateral, fully as long as snout; dorsal fin in a groove, its origin about over the tip of the short pectorals, length anterior to its origin 3.35 in length anterior to vent, extending nearly to tip of tail; anal fin similar to the dorsal and coterminal with it; pectoral short and broad, about as long as snout, 6.7 in head.

Color of preserved specimen light yellow, with large dark brown spots on the body and tail and numerous small to minute ones on the head; small brown spots also present on the ventral surface and a few small dots or spots among the large spots on the sides and on the back of the trunk; back with a row of large dark blotches, interrupted on median line by the dorsal fin; a second row of large dark spots centered more or less on the lateral line, alternating with those on the back; a third row of dark spots lower on the side, mostly below the lateral line or extending only slightly above it; dorsal fin with elongate dark spots rather longer than the pale yellowish interspaces; anal and pectorals pale.

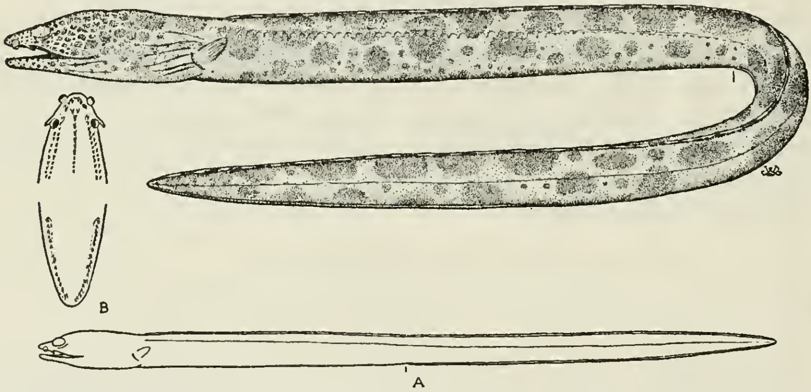

FIGURE 32.—*Ophichthus afuerae*, new species. From the type, 550 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 127836). Inserts: *A*, Diagram showing shape and proportions; *B*, mouth spread open, showing the teeth.

The description is based on a single specimen, 550 mm. long (U.S.N.M. No. 127836), taken by the Mission on a trawl line in about 20 fathoms off Lobos de Afuera Island. In color it is rather similar to the specimen herein described under *O. grandimaculata*, from which it differs, however, in many other respects. The tail is much shorter in proportion to the rest of the body, the body in general is rounder, the snout is broader and projects less strongly beyond the mandible, the pectoral fins are much shorter, and the teeth in the lower jaw are in a single instead of a double series.

Range.—Peru, from Lobos de Afuera Island.

OPHICHTHUS PACIFICI (Günther)

ANGUILA

FIGURE 33

Ophichthys pacifici GÜNTHER, 1870, p. 76, "Chile" and "Tambo River," Peru (original description).
Ophichthys uniserialis COPE, 1877, p. 31, Pacasmayo?, Peru (original description).
Ophichthus pacifici EVERMANN and RADCLIFFE, 1917, p. 25, pl. 3, fig. 2, Paita and Callao, Peru (synonymy; description).—FOWLER, 1941a, p. 366, fig. 9 (references; range).

Body moderately robust in adults, somewhat deeper than broad; head and trunk notably shorter than tail, length anterior to vent 2.2 to 2.5 in total length; head depressed, broader than deep at posterior angle of mouth, its length anterior to gill opening 6.9 to 7.4 in total length, 2.9 to 3.1 in length anterior to vent; depth 7.4 to 8.2 in length anterior to vent, 2.3 to 3.0 in head; snout moderately depressed, moderately broad, extending beyond mandible a distance about equal to half diameter of eye, 5.3 to 6.0 in head; eye rather small, lateral, 8.5 in head, 1.3 to 1.8 in snout; mouth large, the gape reaching far beyond eye, 2.1 to 2.4 in head; teeth rather small pointed, in 2 series in each jaw, though lower jaw occasionally with a few minute teeth representing a third row inside the others; vomer generally with one or two pairs (often not directly opposite each other) of teeth anteriorly, followed by a single series of 9 to 11 smaller teeth; anterior nostril with a short tube, having no fringe or definite flap; posterior nostril with a broad outer flap and a very narrow inner membranous border; no papilla on lip between nostrils; gill openings large, exceed-

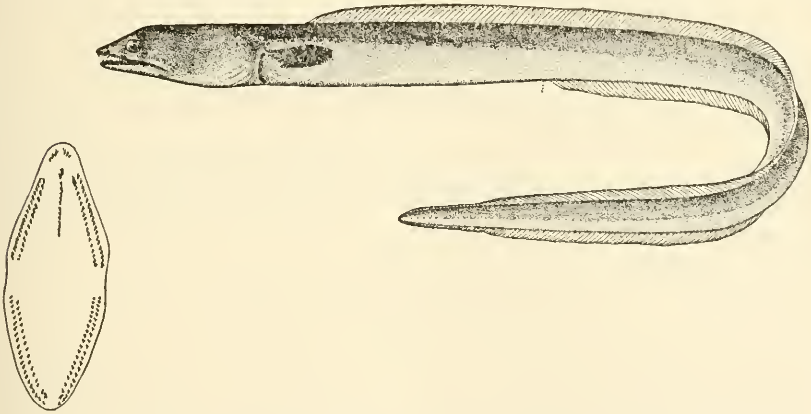

FIGURE 33.—*Ophichthus pacifici* (Günther). From a specimen 680 mm. long, Paita, Peru (U.S.N.M. No. 77687). Insert, mouth spread open, showing the teeth. (After Evermann and Radcliffe, 1917.)

ing length of snout, and also the distance between the two openings ventrally; dorsal and anal fins in grooves, the grooves especially deep near end of tail, the fins moderately broad, with rather definite rays, both ending about an eye's diameter in advance of tip of tail; origin of dorsal somewhat variable, sometimes over beginning of the distal fourth of pectoral, sometimes over tip of pectoral, distance anterior to dorsal 5.2 to 5.5 in length anterior to vent; pectoral quite long, 2.3 to 2.6 in head.

Color of preserved specimens grayish to brownish above, pale underneath, the change of color being rather abrupt in the smaller specimens; nape, at least in small specimens, and the lateral line anteriorly and sometimes throughout with very small pale spots, surrounding pores, the number of spots and their spacing very variable; gill slit with a dark membrane anteriorly in adults; dorsal and anal with many dark points, the fins becoming quite dark posteriorly in adults, paler in young; pectoral pale in young, grayish or brownish in adults, the upper margin and inner surface darkest.

The Mission collected eight specimens, ranging in length from 165 to 825 mm., which were taken at Talara, Chimbote Bay, Mazorka Island, in the Huaura group, and at Pachacamac Island. The two large specimens were taken on a trawl line, two smaller ones were taken with poison, and the rest were caught at night under a light. The larger of the two specimens reported by Evermann and Radcliffe (see reference above), taken at Paita by R. E. Coker, also is at hand.

Range.—Coasts of Peru and Chile.

OPHICHTHUS CALLAENSIS (Günther)

Anguila

Ophichthys callaensis Günther, 1873, p. 92, Callao, Peru (original description).
Ophichthus callaensis Jordan and Davis, 1892, p. 633, Coquimbo and Valparaiso, Chile (original description republished).—Nichols and Murphy, 1922, p. 505, Independencia Bay, Peru.—Fowler, 1941a, p. 364 (references).

Body not much deeper than broad; head and trunk much shorter than tail, length anterior to vent 2.3 to 2.5 in total length; head at posterior angle of mouth a little deeper than broad, its length anterior to gill opening 7.5 to 8.5 in total length, 3.1 to 3.4 in length anterior to vent; depth 8.3 to 10 in length anterior to vent, 2.4 to 3.4 in head; snout rather pointed, extending length of pupil beyond mandible, 6.0 to 7.6 in head; eye 8.4 to 10 in head, 1.4 to 1.45 in snout; mouth large, the gape reaching far beyond eye, 2.1 to 2.4 in head; teeth fairly small, largest anteriorly, in two series in each jaw, inner series in lower jaw incomplete, present only on posterior half of jaw; vomer with 4 or 5 enlarged teeth anteriorly, in an irregular series rather than in definite pairs, followed by a straight series of 8 to 10 smaller teeth; anterior nostril with a short tube, the posterior one slitlike, with a well-raised membrane on outer edge and a very low one on inner edge; no papilla on lip between nostrils; gill openings somewhat longer than snout, about equal to space between them ventrally; dorsal and anal fins in rather prominent grooves, rather broad and with definite rays, origin of dorsal over tip of pectoral, distance anterior to its origin, 5.1 to 5.8 in length anterior to vent; pectoral moderately long, 2.3 to 2.8 in head.

Color of specimens in alcohol many years, uniform grayish brown.

The foregoing description is based on three specimens, 320, 385, and 452 mm. long, taken by the Wilkes Expedition. Two of these specimens are registered in the U. S. National Museum (No. 83369) as questionably from Peru; the third, and largest one (No. 83384), is registered as from Peru without question, but without a definite locality. I have also examined a specimen 480 mm. long from Coquimbo, Chile (U. S. N. M. No. 36931). It seems to have been taken in Peru by only one recent collector (see reference to Nichols and Murphy above), who found a specimen dead on a sandy beach at the head of Independencia Bay.

This eel is related to *O. pacifici,* from which it differs principally in the shape and length of the head and in the arrangement of the teeth in the lower jaw, as shown in the description.

Range.—Coasts of Peru and Chile.

Family BELONIDAE: Houndfishes; Needlefishes; Garfishes

Body very elongate, slender, compressed or not; both jaws greatly produced, forming a beak; maxillary united with premaxillary; jaws with a band of minute pointed teeth, and a row of large teeth; scales small; lateral line low, running along side of belly, becoming midlateral on caudal peduncle; dorsal and anal fins more or less opposite each other; no finlets.

Genus STRONGYLURA Van Hasselt, 1823

Body little, if at all compressed; gill rakers obsolete; dorsal and anal fins elevated anteriorly.

A single species is known from Peru.

STRONGYLURA STOLZMANNI (Steindachner)

PICUDA; AGUJA

Belone stolzmanni STEINDACHNER, 1878, p. 21, Tumbes, Peru (original description based on a specimen 470 mm. long).

Tylosurus stolzmanni EVERMANN and RADCLIFFE, 1917, p. 43 (references).—NICHOLS and MURPHY, 1922, p. 506, Lobos de Tierra Island, Peru (a specimen from the stomach of a pelican).—MEEK and HILDEBRAND, 1923, p. 228, Panama Bay (synonymy; description; range).

Head 3.1; depth 22, or 7.0 in head; D. 14; A. 18; P. 11; V. 7.

Body rather slender, not much deeper than wide at base of ventrals; caudal peduncle notably wider than deep, its depth 4.35 in postorbital part of head; head flat above, its sides vertical, with a broad shallow median groove extending from about posterior angle of mouth to opposite posterior margin of eyes; snout very long, slender, its length to tip of upper jaw 4.7 in length; eye 12.3 in head, or 2.85 in postorbital part of head; interorbital equal to diameter of eye; enlarged teeth in jaws scarcely compressed, rather far apart; scales small, not accurately countable, about 50 oblique rows under base of dorsal, present on interorbital and on the gill covers; lateral line directed upward immediately behind base of anal, becoming midlateral in position and forming a rather prominent keel on caudal peduncle; dorsal only moderately elevated anteriorly, the longest rays about twice diameter of eye, its origin about 1.5 times diameter of eye behind origin of anal; caudal deeply lunate, the lower lobe the longer, about as long as the postorbital length of head and half the eye; anal larger and higher anteriorly than the dorsal, the longest rays about twice diameter of eye, its base 2.2 in head; ventral short, rounded, only a little more than half length of pectorals, inserted nearly equidistant from anterior margin of eye and base of caudal; pectoral pointed, equal to length of postorbital part of head, 4.35 in head.

Color greenish above, sides silvery, pale underneath; a dark band on middle of back and another one along the side; the rays and the distal part of elevated portion of dorsal dark, the rest of fin pale; caudal dusky; outer half of elevated part of anal dusky, the rest of fin mostly pale; ventral pale; pectoral mostly pale at base, distally quite dark.

The Mission secured a single specimen, 252 mm. (231 mm. to base of caudal) long, under a light at Pachacamac Island. It is the third specimen reported from Peru. I have compared this with others from Panama Bay and with two from the Galápagos Islands, and found them all identical. This species is characterized chiefly by the short ventral fins, the rather short dorsal, the strongly depressed caudal peduncle provided with a lateral keel, and the black-tipped dorsal, anal, and pectoral fins.

Range.—Gulf of California to Peru, and the Galápagos Islands.

Family HEMIRAMPHIDAE: Halfbeaks

Body rather elongate, more or less compressed; mandible various, generally greatly produced, equal to or longer than rest of head in Peruvian species; teeth short, in a band in each jaw; gill rakers developed, long or short; scales cycloid, often deciduous; anal fin modified in viviparous species, unmodified and similar to dorsal in others; no finlets; caudal round or forked, if forked the lower lobe the longer.

Two genera, in which the mandible is greatly produced, come within the scope of the present work. The standard length in the species herein considered is the distance between tip of upper jaw and base of caudal.

KEY TO THE GENERA

a. Ventral fins inserted well forward, usually about equidistant from margin of opercle and base of caudal; dorsal and anal origins almost exactly opposite each other; anal generally slightly longer than dorsal.
Hyporhamphus (p. 145)

aa. Ventral fins inserted far backward, much nearer base of caudal than margin of opercle; dorsal origin well in advance of that of anal; dorsal longer than anal-- **Hemiramphus** (p. 146)

Genus HYPORHAMPHUS Gill, 1859

Sides of body not quite vertical, more or less convex; lateral line low, running along side of belly, discontinued on caudal peduncle; dorsal and anal fins almost exactly opposite each other, the latter generally slightly the longer, the last ray of these fins scarcely longer than the immediately preceding ones; ventral fins inserted at or near the midpoint between the margin of the opercle and base of caudal.

HYPORHAMPHUS UNIFASCIATUS (Ranzani)

CHOELO

Hemirhamphus unifasciatus RANZANI, 1842, p. 326, Brazil (original description).

Hyporhamphus unifasciatus EVERMANN and RADCLIFFE, 1917, p. 43, Capón, Peru (description based on the only specimen known from Peru).—MEEK and HILDEBRAND, 1923, p. 237, both coasts of Panama (synonymy; description, specimens from Atlantic and Pacific coast compared; range).

Head (measured from tip of upper jaw) 4.5; depth 7.4, or 1.65 in head; D. 15; A. 17; P. 11; V. 7; scales 56.

Body fairly robust, depth exceeding the thickness at base of ventrals only by about half diameter of eye; head rather flat above, its sides nearly vertical; mandible greatly produced, its length in advance of tip of upper jaw a little shorter than rest of head, 2.6 in length; snout (upper jaw) rather narrowly rounded, 2.8 in head; eye 4.35; interorbital 4.0; teeth in jaws in bands, compressed, chiefly tricuspid; gill rakers scarcely as long as pupil, very short anteriorly, 7 more or less developed on upper and 21 on lower limb of first arch; scales firm, cycloid, 11 oblique rows under base of dorsal; dorsal elevated anteriorly, the longest rays fully as long as postorbital part of head, basal three-fourths or so densely scaled, its origin almost directly over that of anal; caudal deeply lunate, the lobes pointed, the lower one much the longer, anal only slightly longer than dorsal, its base 1.6 in head; ventral scarcely as long as postorbital part of head, inserted a little nearer base of pectoral than base of last ray of dorsal; pectoral rather pointed, 1.5 in head.

Color of preserved specimen slightly brownish above, with many dark or brown punctulations; slightly silvery on sides and below; slight indication of a lead-colored lateral band, and of two dark lines on the back; fins with dark punctulations, most numerous on dorsal and caudal.

The description is based on a specimen about 285 mm. (215 mm. from tip of upper jaw to base of caudal) long, taken by R. E. Coker at Capón, Peru. This is the specimen described by Evermann and Radcliffe (1917, p. 43) and apparently the only one reported from Peru. The specimen was compared with others from Panama Bay with which it agrees almost perfectly. The body is slenderer and the mandible proportionately longer in small specimens than in large ones.

Range.—Gulf of California to northern Peru. Recorded also from the Galápagos Islands as *H. robertsi* by Snodgrass and Heller (1905, p. 349) and by Fowler (1932, p. 6), the specimens upon which the last-mentioned record is based having been compared with the Peruvian specimens by me. This species occurs also on the Atlantic coast, where it ranges from New England to Brazil.

Genus HEMIRAMPHUS Cuvier, 1817

Body compressed, with nearly vertical sides; head rather low; mandible greatly produced, usually longer than rest of head; dorsal fin longer than anal, its origin in advance of anal, its last ray somewhat produced; ventral fins small, inserted much nearer base of caudal than gill openings.

A single species comes within the scope of the present work.

HEMIRAMPHUS SALTATOR Gilbert and Starks

BALAO

Hemirhamphus saltator GILBERT and STARKS, 1904, p. 53, pl. 9, fig. 16, Panama Bay (original description; compared with *H. brasiliensis*).—MEEK and HILDEBRAND, 1923, p. 235, Panama Bay (synonymy; description; range).

Head (measured from tip of upper jaw) 4.4, 4.7; depth 6.1, 6.5; or 1.4, 1.4 in head; D. 12, 12; A. 14, 15; P. 11, 11; V. 6, 6; scales 56, 58.

Body fairly compressed, the sides rather vertical; depth at base of ventrals about 1.5 times the width; caudal peduncle compressed, its depth 4.0, 3.7 in head; head slightly convex above, compressed, its sides vertical; mandible greatly produced, its length in advance of tip of upper jaw greater than rest of head, 3.7, 3.9 in length; snout 2.9, 3.0 in head; eye 4.8, 4.9; interorbital 4.25, 4.3; teeth in the jaws small, in a narrow band in each jaw; gill rakers 28, 28 on lower limb of first arch; scales rather thin, with broad membranous borders; modified scales on head, and some rough sculpturing along upper edge of gill covers; dorsal moderately elevated anteriorly, the longest rays about as long as postorbital part of head, the last ray slightly produced, origin of fin somewhat in advance of vent; anal smaller than dorsal, its origin a little in advance of middle of dorsal base, the last ray scarcely produced, its base 2.6, 2.6 in head; ventral deeply emarginate, inserted less than half as far from origin of anal as from base of pectoral; pectoral long, 1.2, 1.2, in head.

Color bluish gray above; rather abruptly silvery along middle of side. Vertebral and lateral dark streaks, apparently present in smaller fish, are missing in the large ones at hand. Sides of head bright silvery; mandible black, with a pale tip. First few rays of dorsal black, the rest of fin pale; caudal dusky; ventral and pectoral only slightly dusky; anal pale.

The foregoing description is based on two large specimens, 445 and 555 mm. (298 and 380 mm. from tip of upper jaw to base of caudal) long, taken by the Mission in Lobos de Tierra Bay and Lobos de Afuera Bay. The proportions and enumerations given first in the description pertain to the smaller specimen. One was gigged at night and the other one was caught on a hand line. The larger specimen, taken on May 18, 1941, is a gravid female.

Range.—Mexico to northern Peru and the Galápagos Islands. Apparently previously not recorded from Peru.

Family EXOCOETIDAE: Flyingfishes

Body elongate; lateral line low, on ventral edge of abdomen; scales cycloid, rather loosely attached, extending forward on head; pectoral fins large, used in flight; ventrals also enlarged in some genera; the lower lobe of caudal much larger than the upper.

Two genera and species have been taken along the coast of Peru.

KEY TO THE GENERA

a. Ventral fins short, failing to reach origin of anal by about their own length, inserted nearer tip of snout than base of caudal-------- **Exocoetus** (p. 147)

aa. Ventral fins long, reaching well beyond origin of anal, inserted nearer base of caudal than tip of snout------------------------ **Danichthys** (p. 148)

Genus EXOCOETUS Linnaeus, 1758

In this genus, the ventrals are short, failing to reach origin of anal by their own length, and are inserted nearer tip of snout than base of caudal. The dorsal and anal rays are about equal in number, and the origin of the dorsal is almost directly over that of the anal. The pectorals are long, reaching well beyond end of base of dorsal, and the first ray is simple and the second bifurcate.

EXOCOETUS VOLITANS Linnaeus[11]

Exocoetus volitans Linnaeus, 1758, p. 316, Atlantic Ocean (diagnosis).—Abbott, 1899, p. 337, off Peru, lat. 6° S. (partial synonymy; note).—Evermann and Radcliffe, 1917, p. 44 (partial synonymy; field note by R. E. Coker quoted).

Exocetus chiliensis Abbott, 1860, p. 472, Chile (original description).

Head 4.3, 4.2; depth 5.25, 5.4; D. 14, 15; A. 15, 14; P. 14, 14; scales 38, 40.

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[11] The synonymy of this species, which is extensive, is shown rather completely by Breder (1938, p.30), though references to its occurrence in the Pacific are not included.

Body somewhat compressed, slightly quadrate in cross section; caudal peduncle rather strongly compressed, its depth 3.3, 3.4 in head; head moderately flat above, notably deeper than wide; snout short, 5.1, 4.8 in head; eye 3.8, 3.8; interorbital 3.2, 3.2; mouth rather small, terminal; maxillary 4.2, 4.55 in head; teeth not definitely discernible; gill rakers slender, 8 above and 19 below angle on first arch (counted in the smaller specimen only); lateral line not evident on caudal peduncle, lying in a modified row of scales where present; scales large, rather loosely attached; dorsal fin not greatly elevated, its origin almost directly over that of anal, its base 4.1, 4.4 in length; anal base about same length 4.2, 4.4; ventral short, with a definitely concave margin, next to outermost ray longest 1.8 in head in largest specimen (fins broken in smaller one); pectoral very long, reaching nearly or quite to base of caudal, 1.33, 1.33 in length.

Color of old preserved specimens brownish above, sides silvery, pale underneath; dorsal and caudal somewhat dusky gray; anal and ventral pale; pectoral dusky brown.

The foregoing description is based on two specimens, about 205 mm. (163 mm. to base of caudal) and about 210 mm. (173 mm. to base of caudal) long, the caudal fin being damaged in each specimen. The proportions and enumerations given first apply to the smaller specimens in each instance. The fish were taken by the *Albatross* at latitude 6° S., but just how far offshore is not known. These specimens (U.S.N.M. Nos. 41414 and 41353) may be the ones mentioned by Abbott (1899, p. 337). It seems proper to consider that they were taken in Peruvian waters.

Range.—Virtually all warm seas.

Genus DANICHTHYS Bruun, 1934

In this genus the ventral fins are long, reaching well beyond origin of anal, and are inserted nearer base of caudal than tip of snout. The anal and dorsal have about an equal number of rays, the bases are of nearly equal length, and the dorsal is over or little behind origin of the anal. The long pectorals, which reach beyond end of base of dorsal, have the first and second rays simple and the third bifurcate.

DANICHTHYS RUFIPINNIS (Cuvier and Valenciennes)

VOLADOR

?*Exocoetus exsiliens* JENYNS (not of Gmelin), 1842, p. 122, off coast of Peru, at lat. 18° S.

Exocoetus rufipinnis CUVIER and VALENCIENNES, 1846, p. 99, Paita, Peru (original description, based on a specimen 12 inches long).

Exonautes speculiger ABBOTT (probably in part not of Cuvier and Valenciennes), 1899, p. 337 (*E. rufipinnis* Cuvier and Valenciennes in synonymy, and a note. "The fish described by Jenyns as *Exocoetus exiliens* Bloch[12] without doubt belongs to this species").—EVERMANN and RADCLIFFE, 1917, p. 44 (synonymy and note; after Abbott).

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[12] "Bloch" presumably was a slip of the pen, Gmelin being intended.

?*Cypselurus californicus* NICHOLS and MURPHY, 1922, p. 506, Central Chincha Island, Peru (record based on a specimen about a foot long that had washed ashore).

Danichthys rondelctii BREDER (probably in part not of Cuvier and Valenciennes), 1938, p. 85, figs. 44 and 45 (synonymy, discussion, tabular material).

Head 4.75, 5.3; depth 5.5, 5.3; D. 12, 11; A. 12, 12; P. 18, 18; scales 48, 50.

Body compressed, somewhat quadrate in cross section; caudal peduncle moderately compressed, its depth 3.25, 3.6 in head; head flat above, only a little deeper than broad; snout short, 3.3, 3.35 in head; eye 2.75, 2.95; interorbital flat 2.45, 2.45; mouth small, oblique; maxillary extending to vertical below nostril, 4.5, 4.1 in head; teeth small, blunt, in a band in each jaw; gill rakers 9 above and 17 below angle on first arch (counted in female only); lateral line along ventral edge, slightly higher posteriorly, but remaining below midline of side, somewhat raised anterior to ventral fin, lying in a series of modified scales; scales large, cycloid, loosely attached; dorsal fin little elevated anteriorly, the longest rays scarcely exceeding length of snout and half the eye, its origin almost directly over that of the anal, its base 5.75, 6.2 in length; anal a little lower than dorsal, its base 5.75, 6.3 in length; ventral long, the first ray short, less than snout and eye, forming a definite offset in the margin of the fin, second ray branched, its outer branch about three-fourths length of inner one, third ray longest 3.3, 3.4 in length; pectoral very long, reaching base of caudal in male, about to end of dorsal base in female, 1.35, 1.3 in length.

Color bluish brown above, sides silvery, pale underneath; dorsal and anal pale or slightly dusky; ventral dusky, especially on inner sides, with broad, pale, distal and inner margins; pectoral largely dusky on outer surface, its inner surface brownish red, with a rather broad colorless distal margin.

The Mission secured two large gravid specimens, a female about 295 mm. (225 mm. to base of caudal), and a male 310 mm. (248 mm. to base of caudal) long, which flew aboard the trawler on August 17, 1941, about 90 miles off Callao. The proportions and enumerations given first in each instance apply to the female.

Only about three specimens, all large ones, which seemingly belong to this species, have previously been reported from Peru. Evermann and Radcliffe (1917, p. 44) quote a field note by R. E. Coker stating that he purchased eggs in the market of Arequipa, Peru, July 26, 1908, known as "cau-cau," which, according to the fishermen, were the eggs of flyingfish, "volador." If they actually were the eggs of flyingfish they must be more numerous than indicated by the number of specimens secured by collectors.

Some doubt exists as to the correct designation of this species. Much more material than is now available would be needed to determine the relationship. Breder (1938, p. 85) referred *Exocoetus dowii* Gill from Panama to the synonymy of *Danichthys rondeletii* (Cuvier and Valenciennes), and he placed *Exocoetus rufipinnis* in the same synonymy, with a question mark. However, he did not dispose of *Exocoetus californicus* Cooper, which has been recorded from Peru by Nichols and Murphy (1922, p. 506). There can be no doubt that the specimens now at hand are identical with the large specimens named and described as *Exocoetus rufipinnis* by Cuvier and Valenciennes. It seems advisable, for the present at least, to use Cuvier and Valenciennes's name.

Range.—Uncertain. Coast of Peru, and probably northward to or beyond Panama Bay. If identical with *D. rondeletii* (Cuvier and Valenciennes), as may be the case, the Atlantic Ocean and the Mediterranean Sea also should be included in the range.

Family FISTULARIDAE: Cornetfishes

Body very elongate, much depressed, broader than deep; head very long, the anterior bones of skull much produced, forming a long tube; a small mouth at end of tube; both jaws, and usually vomer and palatines with teeth; gills four, a slit behind the fourth; gill membranes separate, free from isthmus; gill rakers obsolete; lateral line present, sometimes armed posteriorly with bony plates; only soft dorsal present, similar to anal and more or less directly opposite it; caudal fin forked, its middle ray produced into a long filament; ventral fins abdominal, far in advance of dorsal; pectorals small, inserted near posterior margin of opercle.

Genus FISTULARIA Linnaeus, 1758

The characters of the genus are sufficiently shown in the description of the family.

A single species, new to the fauna of Peru, is included.

FISTULARIA CORNETA Gilbert and Starks

Aguja

Fistularia corneta Gilbert and Starks, 1904, p. 56, pl. 10, figs. 18, 18a, Panama Bay, and Mazatlán, Mexico (original description; compared with several related species).—Meek and Hildebrand, 1923, p. 249, Panama Bay (synonymy; description; range).

Head 2.6 to 2.9; depth at base of pectoral 10.5 to 14 in head, 8.5 to 10.6 in snout; D. 17 or 18; A. 16 or 17; P. 16 or 17.

Body very elongate, much depressed, its width at base of ventral fins about 1.5 times its depth; head more or less quadrate in cross section, about equal in width and depth at eyes; snout depressed, 1.4 to 1.45 in head; eye elongate, 11 to 14 in head, 7.5 to 9.0 in snout; interorbital 18 to 22 in snout, 4.3 to 6.6 in postorbital part of head; mouth oblique; lower jaw strongly projecting; maxillary posteriorly concave, 13 to 15 in head, 9.0 to 10.5 in snout; teeth minute, in a single series laterally in each jaw; a bony ridge over eye, the opposite ones converging at about the beginning of the posterior fourth of snout, the space between them rather smooth (without definite ridges); posterior half of upper lateral ridge of snout, posterior fourth of lower lateral ridge, and ridge along upper margin of opercle serrate; dorsal ridges of snout without serrae, nearly parallel, but converging near tip of snout; lateral line unarmed; skin in small examples rough to the touch, with minute spines, arranged in more or less definite longitudinal rows, rather larger and blunter on opercle and upper surface of head, skin apparently becoming smooth with age; dorsal and anal similar, anterior lobes pointed, placed directly opposite each other, the longest rays a little shorter than postorbital part of head; caudal forked, the lobes of about equal length, the filament as long as snout and eye or sometimes nearly as long as head; ventral small, equal to or shorter than eye, inserted on lateral ventral edge, generally about an eye's diameter nearer tip of snout than base of caudal; pectoral fully twice as long as ventral, the longest rays near middle of fin in small examples, but the upper ones longest in large ones, 6.5 to 8.4 in head, 4.6 to 5.8 in snout.

Color grayish brown above; pale underneath; small examples with an indefinite dusky streak along lateral line, and some of these with suggestions of dark cross bars on back, large examples plainer; fins plain translucent, with dusky tips in large specimens; caudal filament black.

Many specimens, 130 to 245 mm. (122 to 230 mm. to base of caudal) long, are included in the collection secured by the Mission. These were taken partly with an otter trawl in Sechura Bay, and others were seined in Chilca Bay. The proportions and enumerations used in the description are based on seven specimens 160 to 245 mm. long and one large one 608 mm. long from off Punta Pariña, presented by Lt. Colin Sanborn, U.S.N.R. The name "aguja" seems to be used for the pipefishes (*Syngnathus*) also.

The large specimen differs from the small ones in having smooth skin; the body is broader and proportionately more depressed; the upper rays, instead of the middle ones of pectoral, are longest; and the dark band along the lateral line and dark cross markings are missing. Several large specimens, ranging upward of 370 mm. in length, and two small ones, 205 and 235 mm. long from Panama Bay, the type locality, are at hand for comparison. The interval in size of the large and the small specimens obviously is too great to show gradual changes with age. The large specimens all have smooth skin, whereas the small ones have rough skin. The sculpturing of the head is identical in all the specimens examined, except that the serrations on the several ridges mentioned in the description are less prominent in the large specimens. The proportions based on the small specimens differ from those of the large ones only to a minor degree, the most notable ones being a somewhat broader interorbital (3.9 to 4.4 in postorbital part of head), in the large examples, a difference expected to occur with growth, and the broader and more depressed body (about twice as broad as deep). The enumerations of fin rays and the position of the fins are in agreement in all specimens examined. In the light of this general information it seems advisable to identify the small specimens with the large ones, which obviously are *F. corneta,* at least until a more complete "growth series" becomes available for study.

Range.—Gulf of California to Peru. Previously reported from only as far south as Panama Bay.

Family SYNGNATHIDAE: Pipefishes and Seahorses

Body elongate, with several angles; head in line with axis of body (as in pipefishes) or at an angle (as in seahorses); trunk and tail enclosed in bony firmly connected rings, snout greatly produced, tubelike, bearing a small toothless mouth at its tip; tail long, prehensile in seahorses; males with egg pouch under anterior part of tail, sometimes under body, commonly formed by two folds of skin meeting or overlapping on median line; dorsal fin composed of soft rays only; ventral fins wanting; other fins small or wanting.

KEY TO THE GENERA

a. Body very elongate; head in line with axis of body; tail not prehensile; caudal fin present.
  b. Ridge ("lateral line") along middle of side not interrupted, bent upward and continuous with lateral dorsal ridge of tail__ **Leptonotus** (p. 152)
  bb. Ridge along middle of side interrupted above vent, resumed higher up and continuing with lateral dorsal ridge of tail__ **Syngnathus** (p. 153)
aa. Body less elongate; head placed at an angle to the axis of trunk; tail prehensile; caudal fin absent____________________ **Hippocampus** (p. 156)

Genus LEPTONOTUS Kaup, 1853

Body in large females deep, compressed, the dorsal profile rising suddenly behind head; belly acute; tail about twice length of body; ridge ("lateral line") along middle of side not interrupted over vent, being bent upward and continuous with the lateral dorsal ridge of the tail.

A single species comes within the scope of the present work.

LEPTONOTUS BLAINVILLIANUS (Eydoux and Gervais)

Syngnathus blainvillianus Eydoux and Gervais, 1837, p. 3, pl. 17, Chile (original description).—Günther, 1870, p. 162, Chile, "South Sea" (description).

Leptonotus blainvillii Kaup, 1856b, p. 46, Peru, Chile, etc.—Herald, 1940, pp. 59, 63 (synonymy; range; differentiated in key).

This species, which I have not seen, is included in the fauna of Peru from an old record by Kaup (see reference above). Recent collectors have not taken it in Peru. It is placed in a different genus from the other Peruvian species principally because the ridge on middle of side is continuous over the vent, whereas it is interrupted in the other species of "aguja," or pipefishes. According to Günther's description (see reference above) the dorsal has 35 to 37 rays; and the osseous rings number 20 or 21+50; the length of the body is contained 1.5 to 2.66 in the tail; in old females the body becomes deep and compressed, which according to Herald (1940, p. 63) apparently causes a rapid elevation in the profile just posterior to the head; the snout is longer than the rest of the head; the dorsal fin begins somewhat in advance of the vent; the egg pouch occupies 11 rings; old examples have numerous very small light brown-edged ocelli; and young examples have broad brown cross bands.

Range.—"West coast of South America from Peru south to Orange Bay, South Patagonia, one record from Golfo Nuevo, Argentina" (Herald, 1940, p. 59).

Genus SYNGNATHUS Linnaeus, 1758

Body very elongate, not especially compressed, tapering into a long slender, nonprehensile tail; head slender, in line with axis of body; ridge ("lateral line") along middle of side interrupted above vent, resumed higher up and continuous with lateral dorsal ridge of tail; caudal fin present; anal fin small or absent.

KEY TO THE SPECIES

a. Trunk with 15 rings; tail with 37 to 39; dorsal with 18 to 20 rays, on ¼ to ¾ body and 3½ to 4½ caudal rings..independencia, new species (p. 153)

aa. Trunk with 17 or 18 rings; tail with 41 or 42; dorsal with 36 to 43 rays, on 1½ to 2 body and 7½ to 8 caudal rings................ **acicularis** p. 155)

SYNGNATHUS INDEPENDENCIA, new species

Aguja

Figure 34

Head 11.8 to 12.4; depth (males) 27.7 to 34.5, 2.3 to 2.8 in head; D. 18 to 20; A. 2 to 4; P. 10 or 11; C. 10; rings 15+37 to 39.

Body slender, its greatest depth exceeding its greatest thickness by about half diameter of eye; length anterior to vent 2.9 to 3.0 in length; a rather prominent median ventral keel on trunk; caudal part of body quadrate in cross section; ridge along middle of side interrupted over vent, resumed higher up and running into lateral dorsal ridge posterior to base of dorsal; lateral dorsal ridge of trunk ending somewhere under posterior half of dorsal base; body ridges all rather sharp; snout robust, much shorter than rest of head, with a sharp median ridge, ending somewhere between the eyes, resumed as a lower ridge on head behind eyes, length of snout 2.7 to 3.15 in head; postorbital part of head 2.1 to 2.5; eye 5.25 to 6.2, or 1.65 to 2.3 in snout; interorbital very narrow 12.5 to 18.0; opercle anteriorly with a very low ridge, with low somewhat broken radiating linelike ridges; egg pouch on 18 caudal rings (16 in smallest specimen, possibly not fully developed); dorsal over ¼ to ¾ body ring, and 3½ to 4½ caudal rings, its base 0.95 to 1.2 in head, 11.3 to 14.5 in length; caudal broadly convex; anal rather small, but plainly evident, with two to four rays more or less developed; pectoral short, and broadly rounded, 4.0 to 4.8 in head.

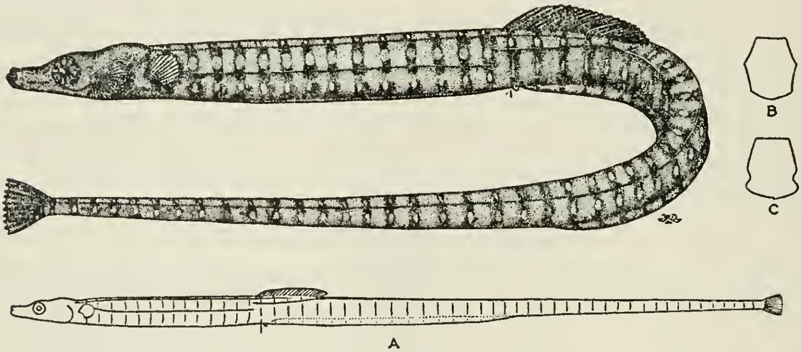

FIGURE 34.—*Syngnathus independencia*, new species. From the type 127 mm. long, Independencia Bay, Peru (U.S.N.M. No. 127853). Inserts: *A*, Diagram showing shape and proportions; *B*, cross section of sixth body ring; *C*, cross section of twenty-second caudal ring.

General color brownish gray, somewhat paler below than above, with about 12 to 14 dark rings, most distinct on back, 3 to 5 of these on trunk; body everywhere with light grayish spots tending to form series along the body ridges, those of the median lateral ridge and those of the lateral ventral ridge tending to connect to form light half-bars on lower part of trunk; the light spots more distinct in some specimens than in others; membranes of pouch with small pearl-gray dots; radiating dark lines on iris, and an irregular pale spot behind eye; dorsal and pectoral colorless; caudal brown, the outside rays pale and barred with brown, faint bars visible on all the rays in one specimen.

The Mission secured four specimens, all males, 79 to 127 mm. (76 to 124 mm. to base of caudal) long, of this apparently undescribed species, which were seined in Independencia Bay, on March 20. The egg pouches in the three larger specimens are filled with eggs. The membranes of the pouch slightly overlap along median line, and the margins are weakly scalloped. The smallest specimen carries no eggs and may be immature. The name "aguja" seems to be used for *Fistularia* also.

This species is close to *S. coccineus* Herald (1940, p. 57) from which it differs in having a shorter head and snout, a larger and better-developed anal fin, apparently a larger egg pouch (on only 15 rings in a paratype, an incubating male, of *S. coccineus* according to the original description), and in color. The type of *S. coccineus*, which is at hand, is dark brown and has large pale blotches, broader than the ground color, on the back. One of the two small paratypes at hand is plain brown, and the other one has traces of light bands on the trunk. No radiating lines are evident on the eyes in the type or paratypes. The differences in proportion are most evident if the two specimens of nearly similar size, the smallest paratype (79 mm. long) of *S. independencia* and the type of *S. coccineus* (89 mm. long), are compared. In the following list, proportions based on the paratype of *S. independencia* are given first: Head in length 12.0, 10.8; snout 38.0, 28.5. Snout in head 3.15, 2.65; eye 5.25, 7.25; postorbital part of head 2.1, 2.6. Eye in snout 1.65, 2.5.

This species is also very close to *S. arctus* (Jenkins and Evermann). The type of *arctus*, which is before me, has the dorsal fin wholly on the first five caudal segments; the snout though quite as short as in *S. independencia* is slenderer; the anal fin is smaller; the body is uniform light brown; and the iris is dusky, there being no trace of radiating lines.

The largest specimen, 127 mm. (124 mm. to base of caudal) long, has been selected as type (U.S.N.M. No. 127853). The following proportions and enumerations are based on this specimen: Head in length 12.4; depth 27; snout 34.5; dorsal base 14.6; length anterior to vent 3.0. Snout in head 2.8; eye 5.55; interorbital 12.5; postorbital part of head 2.45; dorsal base 1.15; pectoral 4.0. Eye in snout 2.0; interorbital 4.5. D. 19; A. 4; P. 10; C. 10; rings 15+39; dorsal on ¼+4½ rings; egg pouch on 18 caudal rings.

Range.—Known only from the type material taken in Independencia Bay, Peru.

SYNGNATHUS ACICULARIS Jenyns

AGUJA

Syngnathus acicularis JENYNS, 1842, p. 147, pl. 27, fig. 3, Valparaiso, Chile (original description).

Siphostoma aciculare EVERMANN and RADCLIFFE, 1917, p. 53, Ancon, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 506, Central Chincha Island, Peru.

Syngnathus acus HERALD (in part not of Linnaeus), 1940, pp. 60, 63 (synonymy; range; differentiated in key).

Head 7.3 to 7.6; depth 30 to 39, 4.1 to 5.1 in head; D. 36 to 43; P. 13 or 14; C. 10; rings 17 or 18+41 or 42.

Body slender, its greatest depth scarcely greater than its greatest width; length anterior to vent 2.5 to 2.6 in length; median ventral keel on trunk rather low; caudal portion of body quadrate in cross section, fully as broad as deep; ridge along middle of side interrupted over vent, resumed a little higher up and running into lateral dorsal ridge at end of dorsal base; lateral dorsal ridge ending under posterior part of dorsal; the lateral dorsal and lateral ventral ridges sharp, the others low; snout rather long and slender, longer than rest of head, with a sharp median ridge ending between front of eyes, resumed behind eyes and extending to vertical from base of pectorals, length of snout 1.95 to 2.1 in head; postorbital part of head 3.0 to 3.2; eye 8.0 to 10, or 4.0 to 5.0 in snout; interorbital 18 to 21; opercle with a low ridge anteriorly, at which low linelike ridges radiate; egg pouch on 18 or 19 caudal rings; dorsal over 1½ to 2+7½ to 8 rings, its base 1.0 to 1.15 in head, 7.1 to 7.5 in length; caudal broadly rounded; anal small, with only about 2 rays; pectoral broad, 4.75 to 6.2 in head.

General color grayish, with faint darker rings between the bony scutes; a dark streak in front of eye, and another on median ventral line of snout; iris uniform dusky; dorsal and pectoral fins colorless; caudal brown, darker than body.

The Mission secured six specimens, five females, 94 to 132 mm. (89 to 127 mm. to base of caudal) long, and one male, 180 mm. (171 mm. to base of caudal) long. Five were seined in Chilca Bay, and one was taken under a light at La Lagunilla. Three specimens 132, 140, and 145 mm. long, two of which are males, secured by R. E. Coker at Ancon, and reported by Evermann and Radcliffe (see reference above), also are at hand. These specimens, and the six preserved by the Mission, form the basis for the description.

Range.—Gulf of California to Chile.

Genus HIPPOCAMPUS Rafinesque, 1810

Head placed at an angle with the body, much as in the horse, its shape also bearing a remarkable resemblance to that of a horse; body compressed; tail prehensile, quadrate in cross section; egg pouch under anterior part of tail; dorsal with 16 to 31 rays, over 3 to 6 segments; pectoral with 13 or more rays.

A single species has been reported from Peru.

HIPPOCAMPUS INGENS Girard

CABALLITO

Hippocampus ingens GIRARD, 1858, p. 342, San Diego, Calif. (original description).—NICHOLS and MURPHY, 1922, p. 506, Lobos de Tierra Island, Peru (record based on a dry specimen presented by an Indian fisherman).—MEEK and HILDEBRAND (in part), 1923, p. 256, Panama Bay (synonymy; description; range).—GINSBURG, 1937, p. 534, fig. 55 (synonymy; description; range).

This species is known from Peru from a dry specimen from Lobos de Tierra Island reported by Nichols and Murphy (see reference above), which I have not seen, and another dry one from Talara lent for study by the Chicago Natural History Museum, which is before me.

This species has 11, rarely 12, trunk segments, and 38 to 40 caudal ones; D. 19 to 21; P. 15 to 17; tubercles well developed in fish of medium size, becoming amost obliterated in large males; coronet moderately high, becoming somewhat lower in large males; snout long, about 10 percent of length; body spotted, often profusely, with whitish dots, tending to form fine white streaks, small dark spots also numerous; dorsal fin generally with a submarginal dark streak, its margin hyaline, fin below the dark streak more or less dusky, diffusely spotted, or sometimes colorless.

Range.—San Diego, Calif., to northern Peru.

Family MERLUCCIIDAE: Hakes

Body elongate; caudal peduncle distinct; head long, low, depressed above, shaped as in the pikes; mouth large; lower jaw projecting; maxillary reaching beyond anterior margin of eye; teeth strong, present on jaws and on vomer; no barbels; gill membranes nearly separate; branchiostegals seven; scales small; more or less deciduous; dorsal fins two, the first one short, the second long, with an indentation, both fins composed of soft rays; anal similar to second dorsal; ventral well developed, subjugular, with seven rays.

This family is composed of a single genus.

Genus MERLUCCIUS Rafinesque, 1810

The characters of the genus are sufficiently indicated for identification in the family description.

A single species is known from Peru. Norman's revision of the genus (1937, pp. 44–49) was used freely in determining the affinity of the species herein described and related ones.

MERLUCCIUS GAYI (Guichenot)

PEJE-PALO

Merlus gayi GUICHENOT, *in* Gay, 1848, p. 329, Chile (original description).

Merluccius gayi EVERMANN and RADCLIFFE, 1917, p. 156, Callao and Paita, Peru (synonymy; description).—NORMAN, 1937, p. 47, fig. 20, B (synonymy; description; range).

Head 3.0 to 3.2; depth 5.4 to 6.2; D. 11 or 12–35 to 39; A. 36 to 38; P. 15 to 18; scales about 120.

Body slender, compressed, its greatest thickness about two-thirds its depth; head long, compressed, flat above; caudal peduncle very slender, 7.0 to 9.5 in head; snout fairly long, depressed, 3.3 to 3.9; eye 5.1 to 5.9; interorbital 3.7 to 4.3; mouth large, moderately oblique; lower jaw projecting strongly, but scarcely entering dorsal profile; maxillary largely concealed under preorbital, reaching a little beyond middle of eye, 2.1 to 2.25 in head; teeth rather large, distally more or less pointed like an arrowhead, present in 2 more or less irregular series in the jaws and on vomer; gill rakers moderately slender, those at angle about two thirds length of eye, 14 to 17 on lower and 3 to 5 on upper limb of first arch; lateral line complete, high anteriorly; scales small, cycloid, partly or all lost in specimens at hand; first dorsal separated from the second by a distance equal to about half diameter of eye, its origin slightly behind base of uppermost ray of pectoral, notably higher than second dorsal, its longest ray 2.2 to 2.6 in head; second dorsal deeply indented at beginning of about its posterior third, its origin a little in advance of that of anal; caudal fin damaged in the smaller specimens studied, certainly emarginate in a specimen 165 mm. long and deeply concave in the large ones (270 and 420 mm. long); anal similar to second dorsal, with similar indentation; ventral inserted a little behind margin of preopercle, scarcely reaching midlength of pectoral 2.2 to 2.35 in head, 6.7 to 7.3 in length; pectoral long, reaching opposite base of the fifth to seventh ray of anal, 1.3 to 1.55 in head, 4.15 to 4.6 in length.

The color of the largest specimen at hand was described by Evermann and Radcliffe (see reference above) as, "dusky on back, becoming lighter on belly; fins dusky; some of lower rays of pectoral, black." A smaller specimen, according to the same authors, was "rosy, dusky on back, silvery on belly; opercle blackish; fins blackish; anterior anal rays and shortened rays in center of second dorsal and anal, whitish." These specimens are now greatly faded.

The Mission furnished two specimens, 165 and 270 mm. (140 and 230 mm. to base of caudal) long. The smaller one was taken in a purse seine at night, 3 miles off Cañete, and the larger one was removed from the stomach of a yellowfin tuna, *Thunnus macropterus*, caught by trolling, at latitude 9° 9′ 75″ S., longitude 75° 32′ W., or about 55 miles west of Chimbote Bay. Nine other specimens, 155 to 420 mm. (135 to 365 mm. to base of caudal) long, collected by R. E. Coker at Paita and Callao, were studied. The last-mentioned specimens are the ones reported by Evermann and Radcliffe (see reference above). The specimen from near Cañete is abnormal in that the second dorsal is fully divided, the anterior part having 16 rays and the posterior 21.

This species is close to *M. productus* (Ayers) of the Pacific coast of the United States and of Baja California. According to 9 specimens of *M. productus* studied, it differs slightly in the rather more numerous rays in the second dorsal and also in the anal. In the 9 specimens examined 1 has 37 rays in the second dorsal, 2 have 38, 2 have 39, 2 have 40, and 2 have respectively 40 and 41, whereas among 11 specimens of *M. gayi*, 1 has 35 rays in the second dorsal, 2 have 36, 3 have 37, 2 have 38, and 3 have 39. In 9 specimens of *M. productus*

1 has 38 anal rays, 2 have 39, 4 have 40, and 2 have 42, while among 11 specimens of *M. gayi* 1 has 36 anal rays, 4 have 37, and 6 have 38. The gill rakers on the lower limb of the first arch in *M. productus*, on the other hand, average rather fewer. Of the 9 specimens examined 2 have 12 rakers, 2 have 13, 2 have 14, and 3 have respectively 15, 16, and 17, whereas among the 10 specimens of *M. gayi* 1 has 14 rakers, 2 have 15, 6 have 16, and 1 has 17. The scales probably are smaller in *M. productus*. However, it is impossible to make an accurate enumeration in either species because some of the scales are missing on every specimen at hand. According to the most nearly accurate counts obtainable, *M. productus* has about 133 to 143 scales in a lateral series above the lateral line, and *M. gayi* has about 120. According to the larger specimens *M. gayi* has a more deeply concave caudal. That the body is slenderer in *M. productus*, as indicated by Norman (1937, p. 47), is not substantiated by the measurements based on the specimens studied, and if the pectoral is longer, it seems to be only a slight average difference.

Specimens from the southern part of the Atlantic coast of South America have been identified as *M. gayi* by several authors. Marini (1933, p. 322) was the first to recognize the Atlantic representatives as specifically distinct from *M. gayi* of the Pacific coast, and he named the Atlantic form *M. hubbsi*. As already pointed out by Marini, and also by Norman (1937, p. 45), *M. hubbsi* has a shorter pectoral fin, which reaches to or a little beyond the beginning of the anal and is contained 5.1 to 6.25 times in the length, and 1.5 to 1.75 in the head in seven specimens, 140 to 235 mm. (121 to 205 mm. to base of caudal) long. The ventral fin, on the other hand, is longer, as it is contained 5.5 to 6.4 times in the length, and 1.6 to 1.85 in the head. It also has fewer pectoral rays, the number being constantly 14 in the seven specimens examined. Furthermore, it has a convex or pointed caudal at a length (of about 200 to 235 mm.) when this fin already is concave in *M. gayi*.

M. angusticeps Garman, known only from deep water from Panama Bay, according to two cotypes at hand, 175 and 178 mm. long, differs from *M. gayi* only in having fewer gill rakers, as only 11 or 12 are present on the lower limb of the first arch, and the eye may be a little larger, being contained 5.0 to 5.2 times in the head.

Range.—Coasts of Peru and Chile.

Family SERRANIDAE: Seabasses

Body oblong, more or less compressed; mouth moderate or large, oblique; maxillary broad, exposed, with or without a supplemental bone[13]; teeth present on jaws, vomer, and palatines (apparently wanting on palatines in *Pinguilabrum*), usually small and conical, some of the jaw teeth more or less enlarged in some genera; gill covers free from the isthmus, sometimes attached to shoulder by a membrane, generally ending in 1 or 2 flat spines; gills 4, a slit behind the fourth arch; branchiostegals 6 or 7; nostrils 2 on each side; lateral line usually complete, not extending on caudal fin; scales moderate or small, extending forward on opercle and cheek, usually ctenoid, occasionally embedded; dorsal with 2 to 15 stiff spines, and 10 to 30 soft rays; anal short, with 3 spines, or rarely with none, and 7 to 12 soft rays; ventrals thoracic, with a slender spine and 5 soft rays.

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[13] Jordan (1923) divided the family Serranidae, as usually understood by authors, into smaller families, basing the divisions principally on the presence or absence of a supplemental maxillary bone. As the divisions made, and the groups erected, are not clearly defined and not well understood (at least by the present writer), Jordan's classification of the seabasses is not used in this catalog.

A large family, of which 14 genera are represented in the Peruvian fauna.

In this family the head was measured consistently from its tip to the point of the principal spine of the opercle, and the depth at the vertical from the base of the ventral fins.

KEY TO THE GENERA

a. Dorsal fin with about 9 to 16 spines; anal with 3 spines; scales on sides of body not embedded, with free margins.

- *b.* Preopercle with one or more antrorse spines at or in front of angle; supplemental maxillary bone present; anal short, with about 7 to 9 soft rays; caudal broadly rounded.
  - *c.* Scales very small, about 145 to 150 oblique series above lateral line; pectoral with about 19 to 21 rays______________ **Acanthistius** (p. 161)
  - *cc.* Scales notably larger, about 70 to 80 oblique series above lateral line; pectoral with about 16 or 17 rays________________ **Alphestes** (p. 163)
- *bb.* Preopercle without antrorse spines at and in front of its angle, the serrae at angle often more or less enlarged, occasionally in 1 or 2 clusters; caudal truncate, emarginate or slightly forked, or more or less rounded.
  - *d.* Caudal long, some of the middle rays produced in adult; lateral line high, not paralleling the contour of back; about 23 gill rakers on lower limb of first arch____________________________ **Hemanthias** (p. 166)
  - *dd.* Caudal not as above, none of the middle rays being produced; lateral line not placed close to back, generally paralleling contour of back.
    - *e.* Dorsal with 11 to 16 spines, and 16 to 19 soft rays; anal with 11 to 13 soft rays (exclusive of *Epinephelus*, which has only 7 to 9).
      - *f.* Dorsal with 16 spines; anal with 13 soft rays; maxillary without a supplemental bone; about 16 gill rakers on lower limb of first arch__________________________________ **Pinguilabrum** (p. 168)
      - *ff.* Dorsal normally with 11 spines; anal with 7 to 12 soft rays; maxillary with a distinct supplemental bone.
        - *g.* Anal with 11 or 12 soft rays; about 20 to 23 gill rakers on lower limb of first arch_____________________ **Mycteroperca** (p. 169)
        - *gg.* Anal with 7 to 9 soft rays; about 9 to 18 gill rakers on lower limb of first arch.
          - *h.* Head broad, depressed between the eyes; scales in lateral line with 4 to 6 strong radiating ridges; 9 or 10 gill rakers on lower limb of first arch_______________ **Promicrops** (p. 171)
          - *hh.* Head narrower, scales of lateral line with normal radiating striae; 13 to 18 gill rakers on lower limb of first arch. **Epinephelus** (p. 172)

ee. Dorsal with 9 or 10 spines, and 10 to 13 soft rays (except *Paranthias*, which has 20); anal with 7 to 10 soft rays.
  i. Dorsal with 10 to 15 soft rays; 12 to 22 gill rakers on lower limb of first arch; caudal not very deeply lunate, the lobes not sharply pointed.
    j. Scales small, about 80 to 110 oblique series above lateral line; ventral fins inserted under or more usually behind base of pectorals.
      k. Body deep, compressed, depth about 2.25 to 2.5 in length; maxillary with a distinct supplemental bone; dorsal with about 10 soft rays; anal with about 9 soft rays. **Hemilutjanus** (p. 173)
      kk. Body more elongate, depth about 3.0 to 4.0 in length; maxillary without supplemental bone; dorsal with about 12 to 15 soft rays; anal with about 7 soft rays.
        l. Head low and broad, scarcely deeper than broad; some spines of dorsal bearing filaments (at least in adults); 12 to 15 gill rakers on lower limb of first arch. **Cratinus** (p. 174)
        ll. Head deeper, notably deeper than broad; some spines of dorsal elevated (in adults) but not bearing filaments; 16 to 22 gill rakers on lower limb of first arch. **Paralabrax** (p. 176)
    jj. Scales larger, about 50 to 75 oblique series above lateral line; ventral fins generally inserted a little in advance of base of pectorals.
      m. Serrae on margin of preopercle all rather small, none arranged in clusters; scales large, about 45 to 50 oblique series above lateral line------------------- **Prionodes** (p. 181)
      mm. Serrae on margin of preopercle enlarged at angle, arranged in 1, sometimes 2, clusters; scales smaller, about 60 to 75 oblique series above lateral line----- **Diplectrum** (p. 184)
  ii. Dorsal with about 20 soft rays; about 25 gill rakers on lower limb of first arch; caudal deeply lunate or forked, the lobes pointed. **Paranthias** (p. 189)
aa. Dorsal with 2 or 3 spines; anal without spines; scales embedded, their margins not free; opercle above posterior angle attached to shoulder by a membrane. **Rypticus** (p. 192)

Genus ACANTHISTIUS Gill, 1862

Body elongate, compressed; mouth large; premaxillaries protractile; maxillary with a supplemental bone; teeth in jaws villiform, in bands, some of the outer teeth more or less enlarged, present also on vomer and palatines; preopercle serrate, with strong antrorse spines on lower border; opercle with three strong spines; gill membranes separate; 7 branchiostegals; pseudobranchiae present; lateral line complete; scales very small, mostly ctenoid; dorsal fin single, with 11 to 13 spines and 15 to 18 soft rays; caudal rounded; anal with 3 spines and 7 to 9 soft rays; ventrals inserted below or behind base of pectorals, close together, with a strong spine; pectorals rounded, with 19 to 21 rays.

A single species is known from Peru.

ACANTHISTIUS PICTUS (Tschudi)

CHERLO; CHOROMELO

FIGURE 35

Plectropoma pictum TSCHUDI, 1845, p. 5, "coast of Peru and Chile."
Acanthistius pictus EVERMANN and RADCLIFFE, 1917, p. 66, pl. 6, fig. 2, Guañape North Island, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 508, Pacasmayo, North Chincha Island, and Lobos de Tierra Island, Peru.

Head 2.5 to 2.6; depth 2.3 to 2.5; D. XI, 17; A. III, 8; P. 19; scales too small to enumerate accurately, about 145 to 150.

Body fairly deep, compressed, deepest over base of pectoral; dorsal profile scarcely convex anterior to nape; snout moderately pointed, 3.15 to 3.5 in head; eye 5.8 to 6.3; interorbital 7.4 to 8.2; mouth large, oblique; lower jaw projecting; lips very thick in large specimens; maxillary about as broad as eye, reaching vertical from posterior margin of pupil, 2.0 to 2.2 in head; teeth in jaws in bands, outer ones somewhat enlarged, the rest small pointed, minute teeth in narrow bands on vomer and palatines; preopercle rather finely serrate along posterior border, spines much larger at angle and on lower border, the 2 anterior ones definitely antrorse; gill rakers rather slender, 10 to 12, exclusive of rudiments, on lower and 2 or 3 on upper limb of first arch; scales very small, strongly ctenoid, missing on snout and ventral surface of head, extending more or less on all the fins; dorsal scarcely notched, origin of fin over base of pectoral, the spines strong, the third to fifth the longest, proportionately shorter in large examples, the fourth 2.6 to 5.0 in head, base of soft part scarcely shorter than that of spinous part, margin convex; margin of caudal broadly convex; second anal spine considerably enlarged, 2.8 to 4.0 in head (6.0 in largest specimen), the soft part with strongly convex margin; ventrals large, reaching nearly or quite to origin of anal in small specimens, failing to reach vent in large ones, inserted behind base of pectoral; pectoral broadly rounded, reaching opposite origin of anal, 1.5 to 1.85 in head.

Color of the smaller preserved specimens dark brown, with indefinite pale areas on back and side, the most conspicuous one under and on the anterior part of soft dorsal; a dark stripe, about the width of pupil extending from snout, through the eye, to upper anterior angle of gill opening, sometimes obscure posteriorly, a bar of similar width extending obliquely downward from the eye, a less distinct one extending from posterior margin of maxillary obliquely across front corner of preopercle; opercle with a black spot between the two uppermost spines, followed by a white margin; fins rather darker than the body, the dorsal blotched like the body. The color markings described are obscure, and in part missing, in the two largest specimens (390 and 470 mm. long).

The Mission furnished six specimens, 180 to 470 mm. (145 to 390 mm. to base of caudal) long, taken near rocks at Lobos de Afuera, and in Chilca Bay. There is at hand also a specimen (U.S.N.M. No. 77604), 220 mm. long, taken by R. E. Coker, at Guañape North Island. These seven specimens form the basis for the description.

In the report of the Mission (1943, p. 278) it is stated that examples up to "about 80 cms. in length" were taken, followed by the remark, "While this species is eaten it does not form any considerable part of the commercial fish landings."

Range.—Coasts of Peru and Chile.

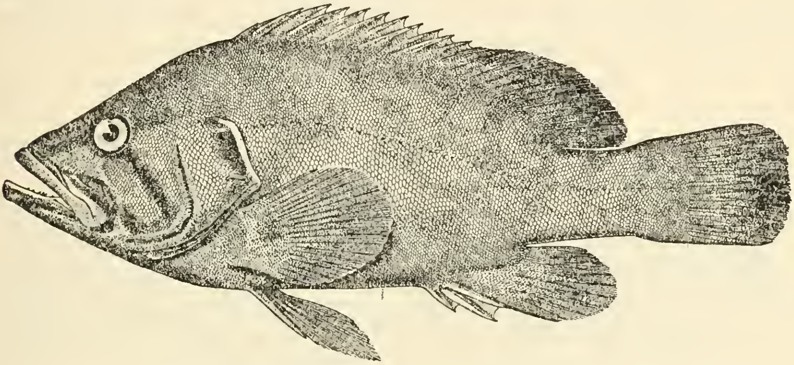

FIGURE 35.—*Acanthistius pictus* (Tschudi). From a specimen 220 mm. long, Guañape North Island, Peru (U.S.N.M. No. 77604). (After Evermann and Radcliffe, 1917.)

Genus ALPHESTES Bloch and Schneider, 1801

Body elongate, compresssed; back moderately elevated; maxillary broad, with a supplemental bone; branchiostegals 7; preopercle with a strong antrorse spine at lower posterior angle; dorsal with 11 spines and 17 to 20 soft rays; anal with 3 spines and 9 soft rays; ventral fins inserted behind base of pectorals; pectoral round, with about 16 or 17 rays.

A single species is represented in collections from Peru.

ALPHESTES FASCIATUS, new species

COMPAÑERO DE MERO; MERO

FIGURE 36

Alphestes multiguttatus EVERMANN and RADCLIFFE (not of Günther), 1917, p. 69, Lobos de Afuera, Peru (synonymy, probably none of it concerning this species; description).

Head 2.4 to 2.8; depth 2.4 to 2.7; D. XI, 17 to 19; A. III, 9; P. 16 or 17; scales about 70; vertebrae 22 (one specimen dissected).

Body deep, compressed, its greatest thickness rather less than half the depth; back elevated; dorsal profile anterior to nape nearly straight; caudal peduncle short, compressed, its depth 3.0 to 3.7 in head; snout pointed, 4.4 to 5.3; eye 4.7 to 5.5; interorbital 7.3 to 8.4; mouth large, oblique; lower jaw projecting, entering dorsal profile;

maxillary extending to or beyond vertical from posterior margin of eye, 2.1 to 2.3 in head; teeth in jaws in bands, some of the outer ones in upper jaw enlarged, the anterior ones more or less caninelike, fixed, the rest mostly depressible; bands of minute teeth present also on vomer and palatines; preopercle finely serrate above angle, the antrorse spine at angle large and strong; gill rakers short, the longest at angle scarcely half diameter of eye, becoming shorter gradually, being represented by mere rudiments anteriorly, 13 to 15 more or less developed on lower and 4 to 6 on upper limb of first arch; lateral line not prominent, variable, many scales without pores in some individuals, missing on only a few scales in others; scales largely without free edges, a patch under pectoral with free, ctenoid margins, scales extending more or less on all the fins; dorsal not definitely notched, the spines strong, the fourth generally the longest, about equal to snout and eye, 2.1 to 2.6 in head, origin of fin a little in advance of insertion of pectoral, its distance from tip of snout 2.5 to 2.8 in length, soft part higher than spinous part, the longest rays at about beginning of posterior third of fin, its margin broadly rounded; anal with strong spines, the second somewhat enlarged, 2.25 to 2.7 in head, the fin ending rather less than an eye's diameter in advance of end of dorsal; ventral inserted behind base of pectoral, with a strong spine contained 3.0 to 3.3 in head; pectoral large, generally reaching fully as far back as ventral, with a broadly convex margin, 1.4 to 1.6 in head.

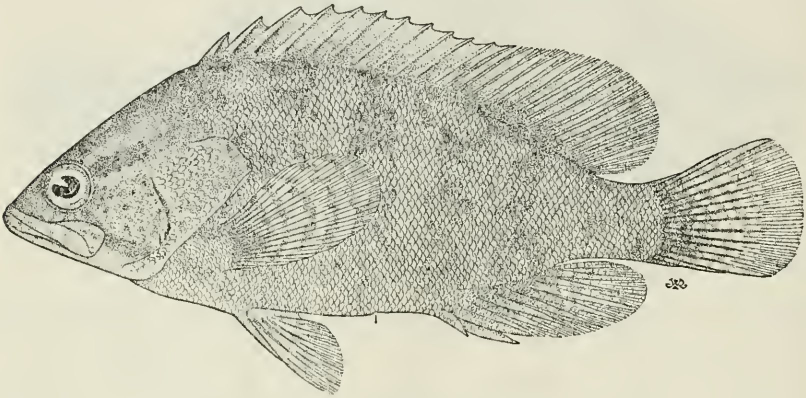

FIGURE 36.—*Alphestes fasciatus*, new species. From the type, 204 mm. long, Lobos de Afuera Bay, Peru (U.S.N.M. No. 127950).

Color of preserved specimens grayish to brownish, somewhat lighter underneath; sides with irregular dark blotches, tending to form cross bars, extending in the lighter colored specimens on the base of dorsal and of anal; a dark band, about as wide as pupil, extending from eye to shoulder, two less distinct ones from eye to preopercular margin, one ending somewhat above angle of preopercle, and the lower one below the angle, these bands sometimes indistinct and occasionally missing; ventral surface of head and chest usually with pale spots; side of head with small black spots, these sometimes extending on anterior part of body, more numerous and more distinct in some specimens than in others; vertical fins about same color as body, the soft parts of dorsal and anal and the caudal with pale spots in light specimens, extending on caudal peduncle in some specimens, the spots obscure or wanting in dark specimens; ventral plain, rather darker than adjacent parts of body; pectoral pale, dark at base, with five or six dark cross bars formed of black spots on the rays.

The description is based on 12 specimens; 11 of these were furnished by the Mission, and 1 was taken by R. E. Coker. They are all adults, ranging from 190 to 275 mm. (155 to 218 mm. to base of caudal) in length, and all were taken in Lobos de Afuera Bay. Those collected by the Mission were mostly taken with a trammel net, set near rocks.

The Peruvian and the numerous Panamanian specimens, with which they have been compared, differ more or less in so many respects that they apparently must be regarded as distinct species. Those from Panama undoubtedly are *A. multiguttatus*, Panama Bay being the type locality for that species, and the only one heretofore known from the Pacific coast of America. The Peruvian specimens therefore require a name. The name *fasciatus* is in allusion to the banded effect of the color markings on the body and the bands on the pectoral fins. A specimen from James Island, of the Galápagos group (U.S.N.M. No. 107069), and another one from Cocos Island (U.S.N.M. No. 119771), both collected by W. L. Schmitt, seem to be identical with the Peruvian material, whereas one from Mazatlán, Mexico, is identical with the Panama specimens.

The Peruvian specimens are deeper, have a smaller eye, generally fewer soft rays in the dorsal, and differ in color. The differences are shown in the parallel columns that follow. Specimens of nearly equal size of the two species were used for measuring.

Alphestes multiguttatus	*Alphestes fasciatus*
Depth of body in percent of length 33.0 to 36.0.	Depth of body in percent of length 37.0 to 41.0.
Eye in percent of head 21 to 25.5, in percent of length 8.3 to 9.2.	Eye in percent of head 18.2 to 20.6, in percent of length 6.75 to 7.2.
Dorsal with 18 rays in 3 specimens, with 19 in 19, and with 20 in 3 specimens.	Dorsal with 17 rays in 3 specimens, with 18 in 8 and 19 in 3 specimens.
General color brown, with dark spots (not blotches), frequently united and forming longitudinal streaks on body and on dorsal fin; no pale spots on ventral surface of head, chest, or caudal fin, no black bands behind eye, or at most only a suggestion of one extending from eye to shoulder.	General color gray to grayish brown, with irregular dark blotches, tending to form cross bands; no dark spots, except for black specks on side of head; ventral surface of head and chest, and caudal and soft dorsal with pale spots; 3 black bands behind eye, these occasionally obscure or missing.

A specimen from Lobos de Afuera Bay, Peru, 204 mm. (160 mm. to base of caudal) long (U.S.N.M. No. 127950), has beeen selected as the type. The following proportions and enumerations are based on this specimen: Head in length 2.7; depth 2.4; length from snout to origin of dorsal 2.7. Eye in head 4.7; snout 5.3; interorbital 8.4; maxillary 2.2; caudal peduncle 3.1; fourth dorsal spine 2.3; second anal spine 2.4; ventral spine 3.3; pectoral 1.5. D. XI, 19; A. III, 9; P. 16; gill rakers 5 + 14; scales about 70. The type is a grayish-brown specimen, on which the color markings described are quite distinct.

According to the report of the Mission (1943, p. 289) the common name "mero" is applied also to *Oplegnathus insignis* (see p. 322). It is stated in the same report that this fish is caught only in northern Peru, where it is considered a fine food fish. The fish are taken chiefly with handlines over rocky bottom in shallow to moderately deep water, the largest commercial catches coming from Talara and Cabo Blanco.

Range.—Northern Peru, Galápagos, and Cocos Islands.

Genus HEMANTHIAS Steindachner, 1874

Body elongate, compressed; head rather short; eye large; mouth strongly oblique; lower jaw projecting; teeth in jaws in narrow bands, a few anterior ones enlarged, caninelike, small teeth present on vomer ane palatines; both limbs of preopercle serrate, the serrae at angle not especially enlarged; gill rakers slender, about 20 to 30 on lower limb of first arch; lateral line rather high, not following the contour of back; scales ctenoid, about 45 to 60 in lateral series; dorsal with 9 or 10 spines; caudal long, some of the rays produced; anal with three graduated spines and about 8 soft rays; ventral inserted under base of pectoral.

A single species comes within the scope of the present work.

HEMANTHIAS PERUANUS (Steindachner)

DONCELLA

FIGURE 37

Anthias (Hemanthias) peruanus STEINDACHNER, 1874, p. 4, Paita and Trujillo, Peru (original description).

Hemianthias peruanus JORDAN and EVERMANN, 1896, p. 1222 (description; range; synonymy).—EVERMANN and RADCLIFFE, 1917, p. 79, pl. 7, fig. 3, Paita, Peru (synonymy; description).

Head 2.8; depth 2.9; D. X, 14; A. III, 8; P. 18; scales about 60, lost in part, 55 with pores.

Body rather compressed, its greatest thickness somewhat more than a third of its depth; back not greatly elevated; dorsal profile of head concave; caudal peduncle rather compressed, 2.6 in head; snout 4.7; eye 4.7; interorbital 5.0; mouth strongly oblique, lower jaw strongly projecting, extending into dorsal outline; maxillary rather broad, reaching below anterior margin of pupil, 2.5 in head; teeth in each jaw in a narrow band anteriorly, the outer row in each jaw somewhat enlarged, each jaw anteriorly with a few canines (in part broken in specimen in hand), fairly prominent teeth on vomer, and an irregular row on palatines; preopercular margin serrate, the angle prominent, the serrae at angle and on horizontal margin larger than those on vertical margin; gill rakers slender, those at angle about two-thirds length of eye, 23 on lower and 9 on upper limb of first arch; lateral line somewhat arched anteriorly, not running close to back; scales fairly small, about 8 complete rows between lateral line and origin of dorsal, 6 at beginning of soft part of dorsal, and 5 at base of last ray, not extending forward on interorbital and snout, 7 or 8 oblique rows on cheek; dorsal spines fairly strong, the third with a filament reaching base of third soft ray from end of fin, the other spines all notably shorter than the soft rays; caudal long, some of the middle rays much produced, the two middle ones shorter, and the membranes between them deeply scalloped, the longest rays about 2.2 in length; anal spines rather strong, graduated, the second 5.0 in head, the soft rays, especially the last two, quite long; ventral inserted under base of pectoral, the middle rays filamentous, reaching base of first soft ray of anal, with slender spine contained 2.6 in head; pectoral inserted a little behind origin of dorsal, rather pointed, the middle rays longest, 1.45 in head, 4.1 in length.

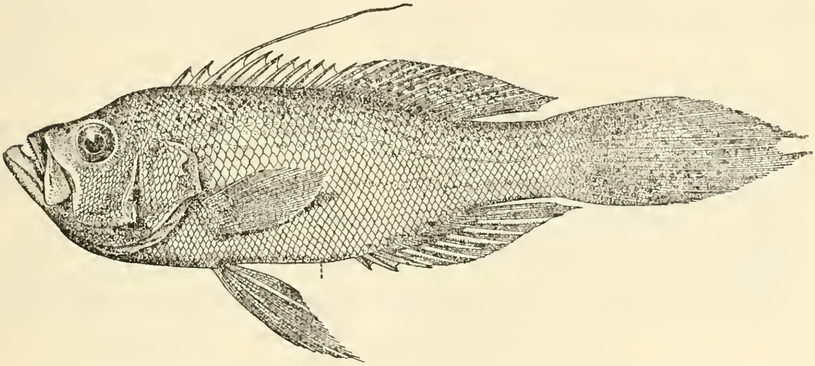

FIGURE 37.—*Hemanthias peruanus* (Steindachner). From a specimen 345 mm. long, Paita, Peru (U.S.N.M. No. 77682). (After Evermann and Radcliffe, 1917.)

Color of preserved specimen uniform pale. "Color rose-red, with small diffuse golden-brown spots on body and on soft dorsal, caudal, and anal" (Jordan and Evermann).

The description is based on the same specimen (U.S.N.M. No. 77682), reported by Evermann and Radcliffe (see reference above), which is 325 mm. (224 mm. to base of caudal) long and was secured at

Paita by R. E. Coker. The species was not secured by the Mission. It is most easily separated from its Atlantic congener, *H. vivanus*, by the lower lateral line, which does not run nearly as close to the back. In *H. vivanus* there are only two complete rows of scales between the lateral line and the beginning of the soft part of dorsal, and only four below the base of the last ray, whereas *H. peruanus* has, respectively, six and five complete rows.

Range.—Reported from the Gulf of California, from a depth of 58 fathoms, and from Peru and Chile.

Genus **PINGUILABRUM**, new name [13a]

Body elongate, compressed; mouth rather small; premaxillaries protractile; lips thick; maxillary without a supplemental bone; teeth in jaws in broad bands, the outer row in each jaw much enlarged, a small patch on vomer, none on palatines; margin of preopercle weakly denticulate, covered by skin; opercle with 2 flat spines; gill rakers short, rather few; branchiostegals 6; lateral line complete, not extending on caudal fin; scales moderately small, mostly ctenoid; dorsal long, continuous, with 16 spines and 16 soft rays; anal with 3 spines and 13 soft rays; caudal truncate; ventral inserted slightly behind pectoral, close together; pectoral rounded.

A single species is known.

PINGUILABRUM PUNCTATUM (Evermann and Radcliffe)

NEGRO

FIGURE 38

Epelytes punctatus EVERMANN and RADCLIFFE, 1917, p. 71, pl. 6, fig. 3, Mollendo, Peru (original description).

Head 3.15; depth 2.75; D. XVI, 16; A. III, 13; P. 20; scales 25–93.

Body elongate, fairly compressed, its greatest thickness only about half its depth; back rather high, descending gently posterior to origin of dorsal; dorsal profile anteriorly rather steep, nearly straight; caudal peduncle very deep, 2.0 in head; snout long, rather blunt, 2.5; eye small, placed high, 6.0; interorbital 4.0; mouth rather small, oblique, nearly terminal; maxillary scarcely reaching vertical from anterior margin of eye, 2.7 in head; teeth in jaws in rather broad bands, the outer ones much enlarged, conical, very small teeth on vomer, none on palatines or tongue; vertical margin of preopercle minutely serrate, the serrae hidden under the skin, the margin at and in advance of angle without serrae; gill rakers short, none more than half length of eye, 16 more or less developed on lower and 8 on upper limb of first arch; scales very small on head, nape, along base of dorsal, on chest and abdomen, ctenoid, extending more or less on all the fins; dorsal continuous, the soft part higher than the spines, the spines after the fourth of nearly uniform height, the last one about two-thirds length of the longest soft ray, 4.4 in head; caudal margin nearly straight, rounded above and below; anal spines small, graduated, the second one 8.4 in head; ventral rather long, the spine not quite half the length of longest soft ray, 4.2 in head; pectoral broad, the margin round, not quite reaching tip of ventral, 1.5 in head, 4.8 in length.

[13a] After these pages had been set up in galley proof Paul H. Oehser, editor of the U. S. National Museum, called the author's attention to the fact that the generic name *Epelytes* is preoccupied in insects. Accordingly, *Pinguilabrum* has been substituted. This name was suggested by the thick or fat lips of the type species.

General color dark brown, paler underneath; base of many of the scales dark, forming dark lines along the oblique rows of scales; head, chest, and abdomen plain; nape and back along base of dorsal with dark spots; the spots extending on the fin, and also on caudal and anal; general color of dorsal and caudal about the same as adjacent parts of body; ventrals darker; pectoral pale brown, becoming darker distally.

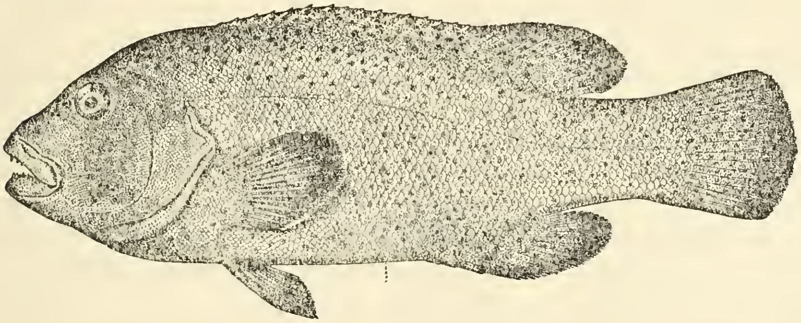

Figure 38.—*Pinguilabrum punctatum* (Evermann and Radcliffe). From the type, 385 mm. long, Mollendo, Peru (U.S.N.M. No. 77688). (After Evermann and Radcliffe, 1917.)

A single specimen (U.S.N.M. No. 77688), taken at Mollendo by R. E. Coker, is known. Although the length was given as 400 mm. in the original description, it is now only 385 mm. (317 mm. to base of caudal) long. The foregoing description is based on the type, which is before me. The shape of the body, the thick lips, the large teeth, and the long dorsal certainly are suggestive of the labrids.

Range.—Known only from Mollendo, Peru.

Genus MYCTEROPERCA Gill, 1862

Body elongate compressed; head large, pointed; lower jaw projecting strongly; dorsal with 11 moderately stiff spines, and about 16 to 19 soft rays; anal with 3 spines and about 11 or 12 soft rays. Otherwise superficially much as in *Epinephelus*.

A single species has been reported from Peru.

MYCTEROPERCA XENARCHA Jordan

Mycteroperca xenarcha Jordan, 1887, p. 387, James Island, Galápagos; Paita, Peru (original description).—Walford, 1936, p. 7 (*M. boulengeri* Jordan and Starks synonymized; description); 1937, p. 103, pl. 11, figs a–c (diagnosis of 3 color phases).

Mycteroperca boulengeri Meek and Hildebrand, 1925, p. 448, Corozal, Canal Zone (references; description; range).

Head 2.6; depth 2.9 to 3.1; D. XI, 15 or 16; A. III, 10 or 11; P. 16 or 17; scales too small to enumerate accurately, about 100 to 108.

Body fairly compressed, its greatest thickness only about half its depth; back moderately elevated; dorsal profile anteriorly slightly convex; caudal peduncle well compressed, 2.8 to 3.4 in head; snout pointed, 3.6 to 4.4; eye 5.7 to 6.5; interorbital 4.25 to 6.9; mouth large, oblique; lower jaw strongly projecting, entering dorsal outline; maxillary moderately broad, with a small supplemental bone, reaching to or beyond vertical from posterior margin of pupil, 2.2 in head; teeth in upper jaw in a narrow band, a few moderately developed fixed canines anteriorly, the outer series laterally slightly enlarged, fixed, the inner teeth depressible, those of lower jaw as in upper jaw though reduced principally to 2 rows, bands of minute teeth on vomer and palatines; vertical margin and angle of preopercle finely serrate, the serrae at angle only slightly enlarged, the horizontal limb mostly smooth; gill rakers moderately slender, those at angle about three-fourths length of eye, 20 to 23 more or less developed on lower and 9 to 12 on upper limb of first arch; scales small, ctenoid, but becoming cycloid anteriorly above lateral line, on head and on chest, extending on snout, maxillary, and mandible; dorsal spines rather slender, the fourth 2.8 to 3.4 in head, decreasing slightly in length behind the fourth, a few soft rays, some produced, forming a pointed lobe; caudal truncate to emarginate, the membranes between the rays scalloped, some of them deeply incised in large specimens, scallops shallow in young, giving the margin an uneven or a jagged appearance; anal spines moderately strong, graduated, apparently becoming proportionately shorter with age, the second 4.1 to 7.2 in head, the middle rays of anal somewhat produced, forming a pointed lobe; ventrals very close together, inserted slightly behind base of pectorals, the inner ray attached to the body by a thin membrane, the spine slender, 3.1 to 3.9 in head; pectoral inserted under or a little in advance of origin of dorsal, with round margin, reaching about to tip of ventral, 1.6 to 1.8 in head, 4.3 to 4.8 in length.

Three color phases have been described by Walford (see references above) as follows: "The gray phase is plain gray or brown, without spots or contrasting marks of any sort. * * * The pinto phase is grayish green, the body covered with irregular round and oblong rings of darker, the rings surrounded by pale spots. Scales on upper part of sides tipped indistinctly with turquoise blue. Dorsal, anal, and ventral fins dark, the dorsals mottled with light and dark gray. Pectoral fin dark gray tinged with yellowish, and with one dark cross bar; caudal dark. Four faint dark bars radiate from the eye; maxillary dark gray edged with yellow. * * * The spotted phase has a gray-brown color, which is paler on the lower part of the sides and below. The head, body, and fins are everywhere covered with small reddish brown spots."

I have seen no specimens from Peru where it has not been taken by recent collectors. It is described here (exclusive of the color) from three specimens (U. S. N. M. Nos. 47481, 80252, and 101061), respectively 215, 270, and 625 mm. (162, 215, and 515 mm. to base of caudal) long. The smallest one is from Mazatlán, Sinaloa, Mexico, and is a "cotype" of *M. boulengeri;* the intermediate one is from a tide stream at Corozal, Canal Zone (Pacific); and the longest one is from Banderas Bay, Jalisco, Mexico. I follow Walford in considering *M. boulengeri* Jordan and Starks a synonym of *M. xenarcha.* The rather large number of gill rakers, the angulate outlines of the soft dorsal and anal, and the scalloped or jagged margin of the caudal are characteristic of this species.

Range.—Gulf of California to the Galápagos Islands and northern Peru.

Genus PROMICROPS Poey, 1868

Body elongate; head broad, depressed between the eyes (especially in large individuals); preopercle with a finely serrate margin, without antrorse spines; scales small, about 100 in lateral series; those in lateral line with 4 to 6 radiating ridges; dorsal with 11 low spines, and 15 or 16 soft rays; anal with 3 spines and 8 soft rays; ventral fins inserted a little behind the pectorals.

PROMICROPS GUTTATUS (Linnaeus)

Perca guttata LINNAEUS, 1758, p. 292, "America" (diagnosis).

Promicrops guttatus JORDAN and EIGENMANN, 1890, p. 363, pl. 42, both coasts of tropical America (synonymy; description; range).—TORTONESE, 1939b, p. 292, pl. 8, Callao, Peru (synonymy; description).

The collections studied do not contain this species. It is included here solely on the record cited above by Tortonese, who had a single specimen from Callao, Peru.

This species, the only one of the genus, may be recognized from the generic account.

Range.—Both coasts of tropical America. On the Atlantic coast from Florida to Brazil and on the Pacific from Baja California to Peru.

Genus EPINEPHELUS Bloch, 1793

Body elongate, moderately compressed; head fairly large, pointed; mouth large; maxillary with a well-developed supplemental bone; teeth in jaws in bands, one or both jaws anteriorly with one or more fixed canines, inner teeth depressible, teeth also present on vomer and palatines; preopercle with serrate vertical limb; its horizontal limb smooth; gill rakers short, few or moderate in number; scales small, ctenoid; dorsal with 11, or occasionally 10, moderately short stiff spines; caudal round to slightly emarginate; anal with 3 spines and 7 to 9 soft rays; ventrals inserted shortly behind base of pectorals.

A single species is known from Peru.

EPINEPHELUS LABRIFORMIS (Jenyns)

Murique

Serranus labriformis Jenyns, 1842, p. 8, pl. 3, Galápagos Islands (original description).—Tortonese, 1939b, p. 290, Callao, Peru (notes).

Epinepheles labriformis Evermann and Radcliffe, 1917, p. 69, Lobos de Afuera, Peru (synonymy; description).—Meek and Hildebrand, 1925, p. 459, Panama Bay (synonymy; description; range).

Head 2.6; depth 2.8; D. XI, 16; A. III, 8; P. 18; scales about 13–105 (too small anteriorly to be accurately enumerated).

Body compressed, its greatest thickness little more than half the depth; back rather high; profile anteriorly gently convex; caudal peduncle quite compressed, 3.4 in head; snout pointed, 4.5; eye 5.8; interorbital 8.5; mouth large, oblique; lower jaw strongly projecting, its tip in line with dorsal profile; maxillary reaching below posterior margin of eye, 2.15 in head; teeth in jaws in bands, one on each side in anterior part of each jaw enlarged, caninelike; very small teeth on vomer and palatines, vertical margin of preopercle finely serrate, the horizontal margin smooth; gill rakers short, those on upper limb nearly all spiny rudiments, none longer than pupil, 16 more or less developed on lower and 8 on the upper limb of first arch; scales small, ctenoid, reduced and more or less embedded on head; dorsal not definitely notched, the spines increasing in length from the first to the fourth, then decreasing very gradually, the longest somewhat longer than the longest soft ray, 2.2 in head; caudal round; anal spines rather strong, the second stronger though not longer than the third, about two-thirds length of longest soft ray, 3.1 in head; ventrals inserted behind base of pectoral, with a rather slender spine, 3.4 in head; pectoral rather large, reaching tip of ventral, with round margin, the longest rays above middle of fin, 1.5 in head, 4.8 in length.

Color dark brown; a black saddle on caudal peduncle; vertical fins rather darker brown than adjacent parts of body, each with a narrow pale margin; ventrals nearly black; pectoral dark brown at base, distal third paler. Only suggestions of pale spots are present on the body, which in specimens from the Galápagos Islands and from Panama are more distinct, and in some individuals are distributed over the entire body.

The description is based on a single specimen (U.S.N.M. No. 77627), which is 220 mm. (176 mm. to base of caudal) long, and was taken at Lobos de Afuera by R. E. Coker. It is one of the two specimens reported by Evermann and Radcliffe (see reference above). It was compared with specimens from the Galápagos Islands and from Panama Bay, with which it agrees, except for the rather smaller eye, shorter snout, and generally plainer color. In two specimens from Panama, 190 and 245 mm. long, and one from the Galápagos, 150 mm. long, the eye is contained in the head respectively 5.0, 5.2, and 4.9 times, and the snout 3.9, 3.6, and 4.2 times. These differences probably are not of specific importance.

It is stated in the report of the Mission (1943, p. 280) that "several specimens were taken at the Lobos Islands with the trammel net." These fishes apparently were not preserved. The species according to the report cited is of limited commercial importance at least at Lobitos and Negritos.

Range.—Gulf of California to the Galápagos Islands and northern Peru.

Genus HEMILUTJANUS Bleeker, 1876

Body rather deep, compressed; head compressed, pointed; mouth large, oblique; lower jaw projecting; maxillary broad, with a distinct supplemental bone; teeth villiform, in bands on jaws, vomer, and palatines; preopercular margin serrate, the serrae somewhat enlarged at and in front of angle; gill rakers rather long, about 20 on lower limb; lateral line complete, following general contour of back; scales rather small, ctenoid, extending on snout, maxillary, and mandible; dorsal with 10 spines and about an equal number of soft rays; caudal emarginate; anal with 3 strong graduated spines and about 9 soft rays; ventrals inserted a little behind base of pectorals; a dark streak along lateral line.

A single species is known.

HEMILUTJANUS MACROPTHALMOS (Tschudi)

OJO DE UVA; PAPANOYA

Plectropoma macropthalmos TSCHUDI, 1845, p. 6, Lurin, Peru (original description)·
Hemilutjanus macropthalmos JORDAN and EIGENMANN, 1890, p. 345 (description; synonymy; range).—EVERMANN and RADCLIFFE, 1917, p. 67, Ballestas Island, Chincha Island, Callao, Mollendo, and Paita, Peru (synonymy; description). —NICHOLS and MURPHY, 1922, p. 508, North Chincha Island, Peru (note).

Head 2.4 to 2.5; depth 2.25 to 2.5; D. X, 10 or 11; A. III, 9; P. 16 to 18; scales 108 to 115.

Body deep, compressed, its greatest thickness notably less than half the depth; back high; profile from snout to nape straight or slightly concave; caudal peduncle well compressed, 2.7 to 2.9 in head; snout rather pointed, 4.1 to 4.6; eye large, 3.5 to 4.2; interorbital 5.1 to 5.6; mouth large, oblique; lower jaw projecting strongly, extending into dorsal outline; maxillary broad, with a distinct supplemental bone, reaching below posterior margin of pupil, 2.0 to 2.25 in head; teeth villiform, in bands on jaws, vomer, and palatines; some of the outer ones in upper jaw slightly enlarged; gill rakers rather long and slender, those at angle about three-fourths the length of the large eye, 19 to 21 on lower and 9 to 12 on upper limb of first arch; scales moderately ctenoid, reduced in size, anteriorly above lateral line and on head, extending forward on snout, present also on maxillary and mandible; dorsal spines strong, the fourth to sixth of about equal length, the others shorter, the fourth 2.4 to 3.0 in head; caudal fin rather deeply emarginate, the upper lobe slightly the longer; anal spines strong, graduated, the second 3.1 to 4.1 in head; ventral inserted a little behind base of pectoral, reaching to or a little beyond vent, with a rather strong spine, 2.5 to 3.0 in head; pectoral inserted well in advance of origin of dorsal, reaching to or somewhat beyond tip of ventral, rather pointed, the longest rays being in upper part of fin, 1.5 to 1.6 in head, 3.8 to 4.0 in length.

Color brownish, somewhat lighter above than below; lateral line in a conspicuous dark streak, fins of about same color as adjacent parts of body, except ventrals which are darker, especially toward tips.

This species is described here from five specimens, 180 to 350 mm. (142 to 280 mm. to base of caudal) long, collected by R. E. Coker at Ballestas Island, Chincha Island, Callao, Mollendo, and Paita. Although the Mission did not furnish specimens, the report (1943, p. 279) states that examples were taken with a trammel net at Lobos de Tierra and at Lobos de Afuera. The very large eye and the dark streak along the lateral line readily distinguish this species from other local serranids. The name "ojo de uva," according to Evermann and Radcliffe (see reference above), is used also for *Conodon serrifer*.

According to the report of the Mission (1943, p. 279) this fish is of some commercial value. It is caught with hand lines over rocky bottom, chiefly from Zorritos to Paita. The average length attained is said to be about 300 mm.

Range.—Coasts of Peru and Chile.

Genus CRATINUS Steindachner, 1878

Body quite elongate, little compressed; head low, scarcely deeper than broad; mouth large, oblique; lower jaw projecting strongly; teeth in jaws in bands, some of the teeth in each jaw enlarged, forming small canines; vertical margin and angle of preopercle serrate, the horizontal margin mostly unarmed; the serrae at angle little enlarged; gill rakers rather short, about 12 to 15 on lower limb of first arch;

lateral line complete, following outline of back; scales rather small, strongly ctenoid; dorsal with 10 spines, some of the spines bearing filaments, and about 13 soft rays; caudal more or less truncate; anal with 3 spines and about 7 soft rays; ventrals inserted a little behind base of pectoral.

A single species of this genus is known.

CRATINUS AGASSIZII Steindachner

PEJE-ZORRO

FIGURE 39

Cratinus agassizii STEINDACHNER, 1878, p. 19, Galápagos Islands (original description).—JORDAN and EVERMANN, 1896, p. 1188, Charles Island, Galápagos (description; references).—EVERMANN and RADCLIFFE, 1917, p. 72, pl. 7, fig. 1, Paita, Peru (synonymy; description).

Head 2.65; depth 3.9; D. X, 13; A. III, 7; P. 19; scales 8–86.

Body low, little compressed, its greatest thickness about three-fourths its depth; back little elevated; dorsal profile anteriorly slightly convex; head over eyes scarcely deeper than wide; caudal peduncle fairly compressed, 3.3 in head; snout long, 3.3; eye 6.9; interorbital 10; mouth large, oblique; lower jaw projecting strongly, extending into the dorsal outline; maxillary only moderately broad, extending below anterior margin of pupil, 2.4 in head; teeth in each jaw in a band, some of the outer ones in upper jaw, and especially the lateral ones in lower jaw, enlarged, caninelike, fixed, small pointed teeth on vomer and palatines; preopercular margin finely serrate, the serrae at angle slightly enlarged, the horizontal limb mostly unarmed; gill rakers strongly spinose, mere spiny tubercles anteriorly on each limb, the longest one at angle little more than half length of eye, 13 on lower and 7 on upper limb of first arch; scales rather small, strongly ctenoid, extending forward on snout, reduced in size on head (except

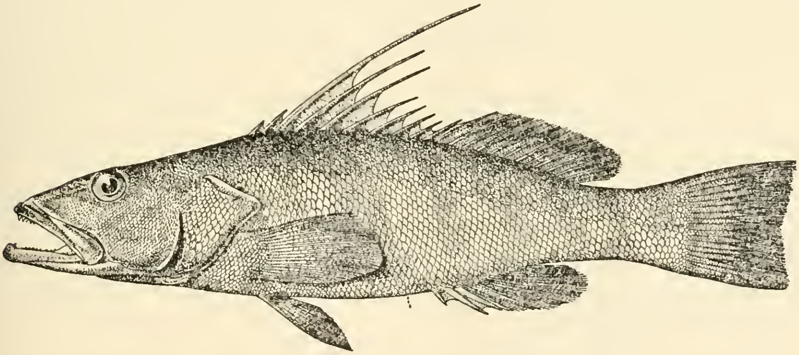

FIGURE 39.—*Cratinus agassizii* Steindachner. From a specimen 330 mm. long, Paita, Peru (U.S.N.M. No. 77645). (After Evermann and Radcliffe, 1917.)

on opercle) and on chest; first two spines of dorsal short, these followed by three spines with free filaments, that of the third spine longest, reaching base of the seventh soft ray, the fin rather deeply notched between the ninth and tenth spines, caudal truncate, the upper lobe the longest; anal small, the second spine scarcely shorter than the third, 4.7 in head; ventral fairly long, pointed, inserted a little behind base of pectoral, with a feeble spine, 3.8 in head; pectoral moderately large, round, inserted under origin of dorsal, 1.7 in head, 4.5 in length.

Color rather pale brown; lower parts a little lighter than the back; fins of about same color as adjacent parts of body, except anal and ventrals, which are a little darker. The "traces of six or seven dusky cross-bands on sides" which this specimen possessed when described by Evermann and Radcliffe (see reference above) have virtually disappeared.

The Mission did not take this species. The description is based on the specimen (U.S.N.M. No. 77645) described by Evermann and Radcliffe (see reference above), which is now 330 mm. (266 mm. to base of caudal) long and was taken at Paita by R. E. Coker. This specimen was compared with a larger one (U.S.N.M. No. 107120), 560 mm. (453 mm. to base of caudal) long, from the Galápagos Islands. The two agree fairly well, except for certain differences that apparently may be ascribed to the difference in age and size. Five, instead of three dorsal spines, bear filaments in the larger specimen, the longest of which extend somewhat beyond the tip of the soft dorsal. The caudal fin is less strongly truncate and its lobes are rounder, and no traces of cross bands are present. The following proportions and enumerations are based on the larger specimen. Head in length 2.75; depth 3.8; pectoral 4.8. Snout in head 2.8; eye 7.8; interorbital 7.8; maxillary 2.25; caudal peduncle 3.3; second anal spine 5.4; ventral spine 4.4; pectoral 1.75. D. X, 13; A. III, 7; P. 19; scales 8–82; gill rakers 6+13.

Range.—Galápagos Islands and northern Peru.

Genus PARALABRAX Girard, 1856

Body elongate, compressed; head rather pointed; mouth large; teeth in jaws in bands, not depressible, the outer ones in each jaw more or less enlarged, small pointed teeth on vomer and palatines; vertical limb of preopercle finely serrate, lower limb with few serrae, often more or less hidden; scales small, ctenoid; dorsal with 10 spines, some of the anterior ones sometimes considerably elevated, soft rays about 12 to 15; caudal slightly rounded to lunate; anal with 3 spines and 7 soft rays; ventrals inserted under or slightly behind base of pectorals.

Two species are known from Peru.

KEY TO THE SPECIES

a. About 80 to 88 oblique series of scales above lateral line and 9 to 12 in a single oblique series between lateral line and base of spinous dorsal; no ctenoid scales between eyes, the interorbital being smooth to the touch; interorbital broad, 4.8 to 5.4 in head in specimens 200 mm. and upward in length; distal margin of pectoral straight to slightly concave, and strongly oblique in large specimens................................ **humeralis** (p. 177)

aa. About 92 to 104 oblique series of scales above lateral line and 13 to 15 in a single oblique series between lateral line and spinous dorsal; ctenoid scales between eyes, making the interorbital rough to the touch; interorbital narrower, 5.6 to 7.6 in head in specimens 200 mm. and upward in length; distal margin of pectoral always round.............. **callaensis** (p. 179)

PARALABRAX HUMERALIS (Cuvier and Valenciennes)

CABRILLA; TRAMBOLLO

Serranus humeralis CUVIER and VALENCIENNES, 1828, p. 246, "Chili" (original description).

Paralabrax humeralis ABBOTT, 1899, p. 348, Callao (synonymy; compared with *P. albomaculatus*; diagnosis).—STARKS, 1906, p. 787, Callao, Peru (variation in color described).—EVERMANN and RADCLIFFE, 1917, p. 73, Callao, Guañape North Island, Chincha Island, Independencia Bay, Santa Rosa Island, Lobos de Tierra, and Mollendo, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 508, Lobos de Tierra Island, South Guañape Island, Isla Blanca Bay, Pescadores Islands off Ancon; and North Chincha Island, Peru.—FOWLER, 1940b, p. 770, Callao, Peru.—WALFORD, 1937, p. 114 (description of color based on preserved material).

Head 2.5 to 2.8; depth 3.0 to 3.7; D. X, 12 to 15, usually 13 or 14; A. III, 7; P. 17 to 19, usually 18; scales 9 to 12–80 to 88.

Body moderately elongate, compressed, its greatest thickness greatly exceeding half the depth; back not strongly elevated; dorsal profile anteriorly gently convex; caudal peduncle compressed, its depth 3.3 to 4.0 in head; snout pointed, 3.2 to 4.4; eye 4.5 to 6.7; interorbital 4.2 to 6.6; mouth large, oblique; lower jaw projecting, entering dorsal outline; maxillary not quite reaching below posterior margin of eye, 2.2 to 2.7 in head; teeth in jaws in bands, the outer ones in each jaw somewhat enlarged, the rest minute, similar small teeth on vomer and palatines; vertical margin of preopercle fine but strongly serrate, the serrae slightly enlarged at angle; those of lower limb small and widely spaced; gill rakers at angle about half to three-fourths length of eye, decreasing to rudiments anteriorly on each limb, 16 to 22 (usually 18 to 20) on lower, and 9 to 12 on upper limb of first arch; lateral line complete, following the curve of the back; scales only moderately small, rather strongly ctenoid, usually missing on interorbital and suborbital, not ctenoid, but more or less embedded there if present, extending somewhat on bases of fins; dorsal somewhat notched, third spine generally longest, rather variable in length, not produced in large specimens, generally about twice as long as the ninth, 2.1 to 3.2

in head, its origin generally about over base of pectoral, its distance from tip of snout 2.5 to 2.8 in length, soft part of fin with a very gently convex margin, none of the rays as long as the longest spines; caudal concave, the outer rays forming rather pointed lobes in large specimens; anal with rather strong spines, the second somewhat enlarged, variable, 2.8 to 5.0 in head; the fin ending nearly an eye's diameter in advance of end of dorsal; ventral inserted under base of pectoral, with a weak spine contained 3.3 to 4.3 in head; pectoral long, reaching well beyond tip of ventral, with a nearly straight oblique margin, which becomes rounded on lower part of fin, the lowermost ray notably less than half length of longest ones, the latter 1.5 to 1.7 in head.

Color of preserved specimens varying from olive-gray to dark brown above; pale underneath; side with six or seven dark cross bars, quite prominent in a couple of small light-colored specimens, very obscure in large dark specimens; head with or without pale spots, few to many if present; peduncle and base of caudal with pale streaks, enclosing dark areas on caudal fin in a few specimens; side of head occasionally with dark specks, blotches, and rarely with indications of a dark band from maxillary to chest; a pale blotch between lateral line and base of anterior soft rays of dorsal frequently present; pectoral with a dark blotch in front of it, and with a brownish base, generally with a narrow pale crescent across base of rays, the rest of fin plain translucent; other fins dusky to quite dark. Concerning the color of the largest specimen preserved by the Mission, which now is dark grayish brown, with pale blotches, M. J. Lobell stated in a field note, "vivid orange colored blotches from caudal peduncle to opercle. On the back the blotches were dark brown."

The Mission supplied 17 specimens, 60 to 450 mm. (46 to 355 mm. to base of caudal) long, collected at Lobos de Tierra Island, Lobos de Afuera Bay, Guañape Island, Chimbote Bay, Don Martin Island, North Chincha Island, Independencia Bay, Atico Point, and Coles Point. In addition there are several specimens at hand collected by R. E. Coker and reported upon by Evermann and Radcliffe (see reference above), and one from Callao taken by the Wilkes Expedition.

This species and *P. callaensis* presumably are not recognized as distinct by the fishermen and are marketed as "cabrilla" or as "trambollo" at Callao and Lima, according to R. E. Coker (see reference to Evermann and Radcliffe above). According to the report of the Mission (1943, p. 278) the flesh is well liked, and these species are fairly important food fishes. The fish were caught by the Mission with trammel nets, gill nets, hand lines, trawl lines, and crab traps. The largest example seen was about 500 mm. long, and the average length was around 300 mm.

Range.—Coasts of Peru and Chile. Once recorded from Panama Bay; not seen there by recent collectors.

PARALABRAX CALLAENSIS Starks

CABRILLA

FIGURE 40

Paralabrax callaensis STARKS, 1906, p. 787, pl. 65, fig. 2, Callao, Peru (original description, based on one specimen).—EVERMANN and RADCLIFFE, 1917, p. 74, Guañape North Island, and Chimbote, Peru (description based on two specimens; compared with *P. humeralis*.—WALFORD, 1937, p. 113 (description of color, based on preserved material).—FOWLER, 1940b, p. 770, fig. 50, "without locality likely from Peru" (the specimen listed is at hand and agrees with other Peruvian material).

Head 2.4 to 2.6; depth 3.1 to 3.25; D. X, 13 or 14; A. III, 7; P. 17 to 19, usually 18; scales about 13 to 15–92 to 104.

Body rather deep, compressed, its greatest thickness fully as great as half the depth; back moderately elevated; dorsal profile anteriorly nearly straight; caudal peduncle moderately compressed, its depth 3.0 to 3.8 in head; snout pointed, 3.4 to 3.9; eye 4.7 to 6.0; interorbital 5.6 to 8.0; mouth large, oblique; lower jaw projecting, entering dorsal outline; maxillary extending nearly or quite to vertical from posterior margin of pupil, 2.3 to 2.6 in head; teeth in jaws in bands, the outer ones in each jaw somewhat enlarged, the rest minute, similar small ones on vomer and palatines; vertical margin of preopercle finely but strongly serrate, the serrae somewhat enlarged at angle, those on lower margin rather larger and more widely spaced than the ones on the vertical margin; gill rakers at angle about two-thirds length of eye, decreasing to mere rudiments anteriorly on each limb, 18 to 22 on lower and 10 to 12 on upper limb of first arch; lateral line complete, following the curve of back; scales quite small, strongly ctenoid, extending forward on interorbital and suborbital, nearly or quite to anterior margin of eye, also extending somewhat on the bases of the fins; dorsal some-

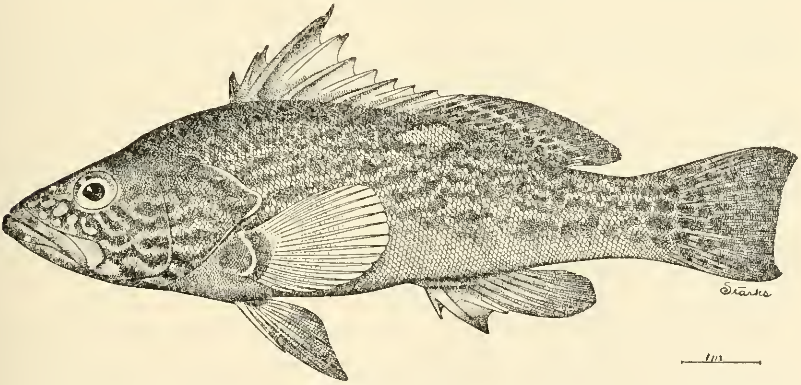

FIGURE 40.—*Paralabrax callaensis* Starks. From the type, 247 mm. long, Callao, Peru (U.S.N.M. No. 53471). (After Starks, 1906.)

what notched, the spines fairly slender, the third spine, especially in large specimens, the longest, sometimes twice as long as the ninth, 1.75 to 2.3 in head; origin of fin about over base of pectoral, its distance from tip of snout 2.6 to 2.8 in length; soft part with gently convex margin, none of the rays as long as the longest spines; caudal concave; anal with strong spines, the second somewhat enlarged, 2.9 to 3.9 in head, the fin ending nearly an eye's diameter in advance of end of dorsal; ventral inserted under base of pectoral, with a weak spine contained 2.7 to 3.8 in head; pectoral fairly long, reaching to or a little beyond tips of ventrals, with rounded margin, the lowermost ray less than half length of the longest ones, the latter 1.5 to 1.75 in head.

Color of preserved specimens variable, grayish to brownish above, pale brownish to silvery underneath; sides with about six or seven more or less distinct dark cross bars, several of the anterior ones present only below lateral line, quite obscure in a few dark brown specimens; head, and sometimes anterior part of back, with pale spots, these spots occasionally confined to sides of head; similar spots present on peduncle and base of caudal in some specimens; these spots both on head and tail more or less united, forming pale streaks in a few specimens at hand; pectoral with a dark brown blotch in front of it, with a brown base, and usually with a distinct narrow light crescent across base of rays, the rest of fin usually plain translucent; other fins dusky to nearly black. One of the large, profusely spotted specimens in which the spots form streaks, was described by M. J. Lobell in his field notes as, "pleasantly marked with horizontally placed spots and wavy lines in a rust color on a brown background."

The Mission furnished eight specimens, 175 to 320 mm. (140 to 255 mm. to base of caudal) long, taken in Lobos de Afuera Bay. In addition, there is a specimen (U.S.N.M. No. 77629) 212 mm. long taken by R. E. Coker at Chimbote.

This species is rather close to *P. humeralis* but is readily separated from it by the smaller scales, as shown by the key and descriptions. The species may be distinguished easily by rubbing a finger forward toward the snout over the interorbital, as *P. callaensis* has rough ctenoid scales on the interorbital, which *P. humeralis* does not possess. If specimens of equal size are compared it becomes evident that *P. callaensis* is a deeper and rather more strongly compressed fish, that the third spine of the dorsal is notably longer, and that the interorbital is narrower, being contained 5.6 to 7.6 in head in eight specimens 200 to 320 mm. long, and 4.8 to 5.4 in eight specimens 225 to 335 mm. long of *P. humeralis*. The pectoral fins also are somewhat differently shaped, those of *P. callaensis* having a convex margin, whereas those of *P. humeralis* have a straight to slightly concave margin.

A specimen (U.S.N.M. No. 94058) 325 mm. long of *P. albomaculatus* from Albemarle Island, Galápagos, collected by W. L. Schmitt, superficially resembles *P. humeralis* but differs from both Peruvian species in having fewer pectoral rays, there being only 16 in the specimen at hand (Snodgrass and Heller, 1905, p. 371, counted 16 or 17 in seven specimens). The shape of the fin, however, agrees with that of *P. callaensis.* In the number of scales (14—96) the Galápagos specimen again agrees with *P. callaensis,* but it lacks rough scales on the interorbital and suborbital. In the slender body (depth 2.6 in length) and in the length of the third dorsal spine (2.4 in head) it agrees with *P. humeralis.* The Peruvian material, therefore, seems to be distinct from the Galápagos species, a matter that has been questioned.

Range.—Coast of Peru.

Genus PRIONODES Jenyns, 1842

Body quite elongate, only moderately compressed; head low, rather pointed; mouth large; maxillary not scaly; teeth in bands on jaws, vomer, and palatines, the jaw teeth not depressible; margin of preopercle serrate, none of the serrae especially enlarged or in clusters; lateral line complete; dorsal with 10 spines and 11 to 13 soft rays; caudal lunate or truncate; anal with 3 spines and about 7 or 8 soft rays; ventrals close together, generally inserted slightly in advance of base of pectorals.

The species of this genus are of small size, and usually bright in color. Two are known from Peru. A third species, *Serranus peruanus* Lesson (1830, p. 234), described from specimens from Paita, was assigned to this genus by Evermann and Radcliffe (1917, p. 78). I am unable to determine from the original description whether it belongs to this genus or one of several others. The following enumerations are given: D. X, 12; A. III, 9; P. 13. These enumerations and a description of the color of a fresh specimen, which is not especially helpful, comprise the description. There is no serranid in the collections now at hand that has the combination of the fin formulas given. No further mention will be made of this at least nominal species.

KEY TO THE SPECIES

a. Body rather robust, its depth 3.3 in length; eye fairly small, 5.25 to 5.5 in head; gill rakers few, only 9 on lower limb of first arch, chest with black spots and specks; vertical fins with dark spots or mottlings_ **fasciatus** (p. 182)

aa. Body more slender, depth about 4.0 in length; eye large, 4.0 in head; gill rakers more numerous, 12 or 13 on lower limb of first arch, chest unspotted; fins without spots or mottlings________________________ **huascarii** (p. 183)

PRIONODES FASCIATUS Jenyns

CARAJO; CARAJITO

FIGURE 41

Prionodes fasciatus JENYNS, 1842, p. 47, pl. 9, fig. 1, Chatham Island, Galápagos (original description).—EVERMANN and RADCLIFFE, 1917, p. 77, Lobos de Afuera, Peru (synonymy, description).—MEEK and HILDEBRAND, 1925, p. 470, Panama Bay (synonymy; description; range).

Head 2.7, 2.8; depth 3.4, 3.3; D. X, 12, X, 12; A. III, 7, III, 7; P. 17, 17; scales 5–50, 5–49.

Body fairly robust, its greatest thickness about two-thirds of its depth; dorsal profile anteriorly gently convex; caudal peduncle compressed, 3.0, 2.85 in head; snout moderately pointed, 3.8, 3.6; eye 5.25, 5.55; interorbital 8.2, 6.0; mouth rather large, oblique; lower jaw projecting, entering dorsal outline; maxillary extending about opposite posterior margin of pupil, 2.33, 2.15 in head; teeth in each jaw in a band, some of the outer ones enlarged, caninelike, especially a pair on each side in anterior part of upper jaw, and two or three laterally in lower jaw; small teeth present also on vomer and palatines; vertical limb of preopercle finely serrate, lower limb smooth anteriorly, none of the serrae enlarged; gill rakers very short, spinose, nine more or less developed on lower and five or six on upper limb of first arch; lateral line complete, following curve of back, scales moderately large, ctenoid, not extending forward on interorbital or snout, small on preopercle, mostly fully as large on opercle as on body; dorsal continuous, the posterior spines nearly as long as the fourth, the latter 3.5, 3.6 in head, origin of fin over base of pectoral, the soft part higher than the spines; margin of caudal nearly straight, the upper angle slightly produced; anal spines short, moderately strong, the second 3.2, 3.6 in head, only a little more than half the length of longest soft rays; ventral inserted slightly in advance of base of pectoral, with a moderately strong spine contained 3.5, 3.8 in head; pectoral reaching far beyond tip of ventral, the longest rays below middle of fin, its distal margin above longest rays oblique, nearly straight, 1.4, 1.4 in head.

Color dark grayish brown above; pale gray below; lower part of side with six or seven dark blotches, some of them vertically elongated; chest with irregular black spots or specks; soft dorsal and the outer rays of caudal with small black spots; caudal and anal with dusky mottlings, sometimes forming ellipses with a slight dot in center; ventral rather darker than adjacent parts of body; pectoral slightly dusky at base and with an irregular black spot, the rest of fin plain translucent.

"Color in life: Two rows of spots on the sides; the spots of the same row may tend to run together, or the spots of one row may be more or less fused with corresponding spots in the other row; hence some specimens present a sort of transversely barred effect, while others are indistinctly striped.

"Much red and orange about lower parts of head. Rows of red spots between the fin rays of the caudal and on the rays of the pectoral" (Evermann and Radcliffe).

Only two specimens, 145 and 190 mm. (113 and 150 mm. to base of caudal) long, from Peru are at hand. The smaller one was taken in Lobos de Afuera Bay by the Mission, and the larger one at the island by the same name by R. E. Coker. The proportions and enumerations stated first in each instance are based on the smaller specimen. Several specimens form the Galápagos Islands, the type locality, a few small ones from Gorgona Island, Colombia, several from Panama Bay, and one from Acapulco, Mexico, have been compared. Although there is great variation in color, structural differences were not detected.

Range.—Gulf of California to the Galápagos Islands and northern Peru.

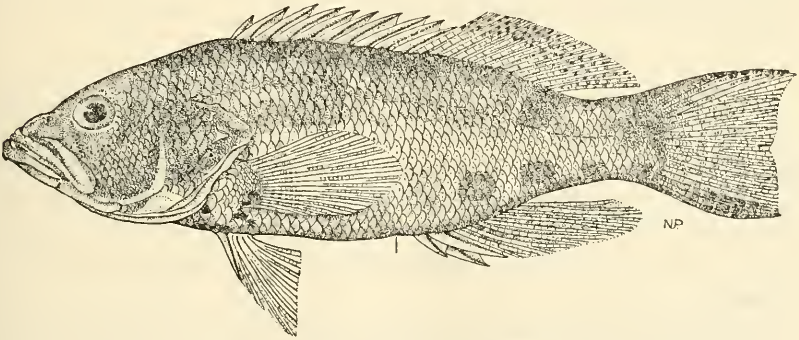

FIGURE 41.—*Prionodes fasciatus* Jenyns. From a specimen 190 mm. long, Lobos de Afuera Island (U.S.N.M. No. 77676). (Drawn by Nancy Patton.)

PRIONODES HUASCARII (Steindachner)

CAMOTILLO

Serranus huascarii STEINDACHNER, 1902, p. 112, pl. 2, fig. 1, Paita, Peru (original description based on a specimen 195 mm. long; compared with *S. aequidens* Gilbert).

Prionodes huascarii EVERMANN and RADCLIFFE, 1917, p. 78 (reference only).

Head 2.8; depth 4.0; D. X, 12; A. III, 7; scales 6–48.

Body elongate; snout 3.75 in head; eye 4.0; interorbital 8; mouth large, oblique; lower jaw projecting; maxillary not quite to middle of eye; teeth in jaws small, in bands, becoming narrow posteriorly, those in outer row in upper jaw, those in outer row anteriorly, and those in inner row laterally in lower jaw, slightly enlarged; teeth in bands also on vomer and palatines; margin of preopercle scarcely convex, directed slightly backward toward the blunt angle, the serrae becoming a little larger toward the angle, only the posterior half of its lower margin weakly serrate; opercle with three sharp spines; gill rakers on lower limb of first arch 12 or 13, the 3 anterior ones very small; spines of dorsal low, increasing rapidly in length from the first to the fourth, then decreasing, the fourth 2.6 in head; second spine of anal a little stronger, but scarcely longer than the third, about two-thirds to three-fourths as long as the longest soft ray; pectoral reaching nearly to vent, 1.4 in head.

Color dark gray; an indefinite dark longitudinal band on side; 5 or 6 dark cross bands extending downward from nape and base of dorsal; inner side of gill covers deep black; fins, especially the ventral, quite dark (dark gray in life), without spots or stripes.

No specimens are at hand. The description was compiled and condensed after Steindachner (see reference above), who had one specimen, 195 mm. long, from Paita, Peru, and a second specimen from the "coast of Chile." The proportions given apparently are not based on accurate measurements, as the author prefaces them in part with "circa."

Range.—Coasts of Peru and Chile.

Genus DIPLECTRUM Holbrook, 1855

Body elongate, moderately compressed; opercle usually armed with one cluster of strong divergent spines at its angle, occasionally with two clusters; snout and interorbital space naked; lateral line complete; scales moderately small, firm, ctenoid; dorsal rather low, with 10 spines and usually with 12 soft rays; caudal lunate to slightly forked; ventrals inserted under or a little in advance of base of pectorals.

Two species are included among the specimens from Peru now before me. Three others, *D. euryplectrum*, *D. macropoma*, and *D. pacificum*, may be expected there. All apparently are fairly common in Panama Bay, and of the first one named there is a specimen in the U. S. National Museum (No. 41148) from the Galápagos Islands. *D. macropoma* was reported from Ecuador by Meek and Hildebrand (1925, p. 475). However, it appears now that the record was based on a general label "Ecuador to Panama" attached to a jar in the U. S. National Museum. A check of each specimen contained therein reveals the fact that they are all from Panama Bay. A key to the species named, and to the two included in the Peruvian collections studied, is given below. No descriptions of the species not actually known to occur in Peru are offered but are included in Meek and Hildebrand (1925, pp. 472–478). The key will aid in showing the relationship of the Peruvian species, especially the new one herein described, to the neighboring species.

KEY TO THE SPECIES

a. Anal fin normally with 8 soft rays; 13 to 16 gill rakers on lower limb of first arch; eye large, 3.3 to 4.0 in head; caudal peduncle slender, 3.5 to 3.8 in head; base of soft dorsal dusky to black________________euryplectrum *aa.* Anal fin normally with 7 soft rays; gill rakers fewer (except in *conceptione*); eye smaller, generally more than 4.0 in head; caudal peduncle usually deeper, less than 3.5 in head; base of soft dorsal not black.

- *b.* Scales large, 52 to 58 in a lateral series, 4 or 5 complete longitudinal rows between anterior spines of dorsal and lateral line, 5 or 6 oblique rows on cheek-- **macropoma**
- *bb.* Scales smaller, more than 58 in a lateral series, 6 or more complete rows between anterior spines of dorsal and lateral line; 7 or more oblique rows on cheek.
  - *c.* Spines at angle of preopercle graduated in each direction from center of cluster, the two center ones not especially enlarged or definitely more divergent than the others, about 10 spines more or less enlarged; 11 to 14 gill rakers on lower limb of first arch.
    - *d.* Snout rather blunt; lower jaw not projecting strongly, its tip definitely below the general dorsal outline of head; scales on opercle notably larger than those on cheek, 4 or 5 in an oblique series below base of opercular spine; caudal deeply concave, or forked; pectoral rather symmetrically rounded------------------------------- **pacificum**
    - *dd.* Snout pointed; lower jaw projecting strongly, its tip continuous with the general dorsal outline of head; scales on opercle scarcely larger than those on cheek, 6 or 7 in an oblique series below base of opercular spine; caudal much less deeply concave, merely lunate; pectoral obliquely rounded--------------- **maximum**, new species (p. 185)
  - *cc.* Two center spines of cluster at angle of preopercle much enlarged and strongly divergent, 4 to 6 spines more or less enlarged; 15 or 16 gill rakers on lower limb of first arch; snout rather blunt; lower jaw projecting slightly, its tip definitely below the general dorsal outline of head------------------------------------- **conceptione** (p. 187)

DIPLECTRUM MAXIMUM, new species

FIGURE 42

Diplectrum conceptione EVERMANN and RADCLIFFE (in part not of Cuvier and Valenciennes), 1917, p. 75, pl. 7, fig. 2, Lobos de Tierra and Paita, Peru (synonymy; description and figure, both based on a specimen which apparently is of the new species herein described).

Head 3.1; depth 4.1; D. X, 12; A. III, 7; P. 17; scales 7–73.

Body quite elongate, moderately compressed, its greatest thickness about three-fourths its depth; dorsal profile anteriorly nearly straight; caudal peduncle rather compressed, 2.7 in head; snout rather narrow, and pointed, 3.5; eye 4.4; interorbital 6.6; mouth large, oblique; lower jaw strongly projecting, entering the general outline of the back; maxillary extending opposite posterior margin of pupil, 2.2 in head; teeth as in *D. conceptione*; angle of preopercle greatly produced, with about 10 more or less enlarged spines, the center ones not much larger than some of the others and not strongly divergent, the vertical margin strongly though finely serrate, the horizontal margin smooth; gill rakers at angle about half length of eye, 12 more or less developed on lower, and 7 on upper limb of first arch; scales firm, strongly ctenoid, 10 oblique rows on cheek, and 6 or 7 in an oblique series below base of opercular spine; dorsal moderately notched, the fourth spine a little longer than the third and fifth, about the same length as the longest soft rays, 2.4 in head; caudal rather gently concave, the angles somewhat produced, the upper one somewhat longer than the lower; anal small, the third spine scarcely longer or stronger than the second, the latter 4.3 in head; ventral large, inserted under base of pectoral, its spine 4.3 in head; pectoral long, reaching little beyond tip of ventral, with obliquely rounded margin, the fourth to sixth rays counting downward being the longest, 1.3 in head, 4.1 in length.

Color grayish brown, somewhat darker above than below; side and back indefinitely blotched with light and dark areas; occiput with a few pale spots, with dark rings and dark centers; a large dark area on opercle; dorsal pale brown, membrane behind each spine narrowly margined with black, soft part with suggestions of slightly darker spots; caudal brown, with suggestions of dark spots on upper lobe; anal and pectoral plain translucent; ventral largely dusky.

The description is based on the type (U.S.N.M. No. 77624), 300 mm. (245 mm. to base of caudal) long, taken at Paita by R. E. Coker.

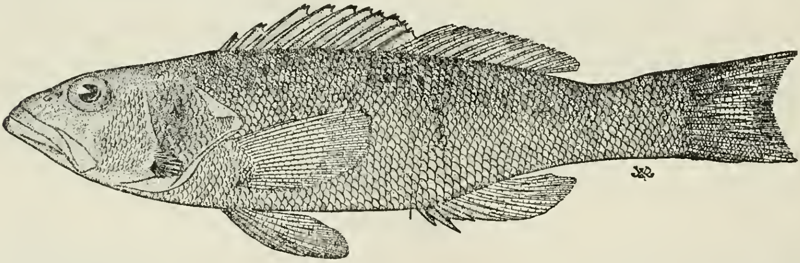

FIGURE 42.—*Diplectrum maximum*, new species. From the type, 300 mm. long, Paita, Peru (U.S.N.M. No. 77624).

It is the largest specimen reported as *D. conceptione* by Evermann and and Radcliffe (see reference above). This specimen differs from those herein described as *D. conceptione* in having a notably longer and more pointed snout, with a much more prominently projecting lower jaw, the tip of which is in line with the dorsal outline of the snout. The gill rakers on the lower limb of the first arch are fewer, the angle of the preopercle is much more strongly produced, and a larger number of spines is enlarged with the middle ones much less divergent. It is known that the preopercular spines change somewhat with age in some of the other species, but the changes noticed are not comparable with the differences between this large specimen and the smaller ones of *D. conceptione* at hand. The pectoral fin is differently shaped, the fourth to the sixth rays being the longest, instead of the sixth and seventh; there are two more oblique rows of scales on the cheek, and two fewer scales in an oblique row from opercular spine to margin of preopercle.

A second specimen (U.S.N.M. No. 77698) 275 mm. (223 mm. to base of caudal) long, taken by R. E. Coker at Lobos de Tierra, apparently also is of this species. This is the fish described and illustrated by Evermann and Radcliffe (see reference above). As its mouth is thrown wide open it is impossible to determine the exact shape of the snout or the proportionate length of the lower jaw. Furthermore, the preopercular spines are in part broken. Sufficient spines are left, however, to show that none of them diverge strongly. There are 12 gill rakers on the lower limb of the first arch, 9 oblique rows of scales on the cheek, and 7 in an oblique series between base of opercular spine and margin of preopercle. In all these characters the specimen essentially agrees with the type, as it does in the shape of the pectoral and caudal. However, there are fewer (65) oblique series of scales above the lateral line, wherein it agrees with *D. conceptione.* The color, as far as determinable from the old preserved specimens, agrees fairly well with the type.

In the development and arrangement of the preopercular spines *D. maxima* is in virtual agreement with *D. pacificum* Meek and Hildebrand known from Panama Bay and northward. It differs from that species, however, in the same way and to the same degree as it does from *D. conceptione* in the longer and more pointed snout; more strongly projecting lower jaw; in the proportionately longer and stronger second anal spine; in the notably less deeply concave caudal; and in the shape of the pectoral fin. It differs, further, from *D. pacificum* in the smaller scales on the opercle, which also are rather smaller on the cheek. Named *maximum* because it is among the largest of the genus.

Range.—Northern Peru; known only from Paita and Lobos de Tierra.

DIPLECTRUM CONCEPTIONE (Cuvier and Valenciennes)

CAMOTILLO; CAMOTE

Serranus conceptionis CUVIER and VALENCIENNES, 1828, p. 246, Concepción, Chile (original description; compared with *D. radialis*).

Plectropoma paytensis LESSON, 1830, p. 233, Paita, Peru (original description).

Diplectrum conceptione ABBOTT, 1899, p. 349, Callao, Peru (description, based on 5 specimens).—EVERMANN and RADCLIFFE (in part not of Cuvier and Valenciennes) 1917, p. 75, pl. 7, fig. 2, Lobos de Tierra and Paita, Peru (synonymy; description, based mostly on a specimen which apparently is not of this species).

Head 2.7 to 3.0; depth 3.6 to 3.8; D. X, 12; A. III, 7; P. 17 or 18; scales 6–64 to 68.

Body low, compressed, its greatest thickness about two-thirds its depth; dorsal profile anteriorly nearly straight; caudal peduncle compressed, 2.9 to 3.3 in head; snout somewhat pointed, 4.1 to 4.5; eye 4.2 to 4.5; interorbital 7.1 to 8.2; mouth large, oblique; lower jaw slightly projecting, not entering dorsal outline; maxillary extending opposite posterior margin of pupil, 2.3 to 2.4 in head; teeth in jaws in narrow bands, some of them somewhat enlarged, villiform teeth on vomer and palatines; angle of preopercle with two notably enlarged diverging spines, with one and sometimes two above and below this pair, also somewhat enlarged, vertical margin strongly though finely serrate, horizontal margin anteriorly smooth; gill rakers slender, those at angle about half length of eye, 15 or 16 more or less developed on lower and 8 or 9 on upper limb of first arch, scales strongly ctenoid, 7 or 8 oblique rows (running upward and backward) on cheek, and 8 or 9 in an oblique row below base of opercular spine; dorsal scarcely notched, the fourth spine longest, a little longer than longest soft rays, 2.2 to 2.5 in head; caudal deeply concave, the upper lobe notably the longer; anal small, the third spine longest, the second strongest, 4.1 to 4.6 in head; ventral inserted under or slightly in advance of base of pectoral, with a rather slender spine contained 2.3 to 2.7 in head; pectoral long, reaching well beyond tip of ventral, with round distal margin, the sixth or seventh ray, counting downward being the longest, 1.25 to 1.4 in head, 3.7 to 3.9 in length.

Color grayish brown above; light brown to pale below; sides with about seven indefinite broad dark bars; a large dark blotch on opercle, and another on base of caudal fin. The smallest specimen has two faint longitudinal dark stripes, one above and one below lateral line. These stripes probably are present in all the young of the genus. Dorsal and caudal dusky; soft dorsal somewhat mottled with pale and dusky streaks and dots; anal plain translucent; ventral largely dark to nearly black; pectoral pale to slightly dusky.

The color of a small specimen (U.S.N.M. No. 77549), 117 mm. (92 mm. to base of caudal) long, was described by R. E. Coker, as quoted by Evermann and Radcliffe, as follows: "Color in life * * * back and sides olivaceous, mottled with reddish; rather inconspicuous short orange stripe on posterior ends of premaxillary and maxillary, extending posteriorly and ventrally; region of upper teeth yellow; roof of mouth and floor, (posterior to anterior ventral end of first branchial arch) yellow, sometimes with some black on each side above and below; lining of gill cavity black posteriorly; large bright yellow spot on side, forward of anus and just below mid-line; belly yellow in median line, in posterior half; dorsal translucent, but thinly mottled with olivaceous and orange; membrane just posterior to each spine tipped with reddish orange; a minute black speck on membrane just at tip of each spine; soft dorsal tipped with reddish orange; anal almost entirely yellow; caudal and ventrals dusky olivaceous."

The Mission secured a single specimen, 170 mm. (138 mm. to base of caudal) long, which was taken in Tortuga Bay. Four of the five specimens listed as this species by Evermann and Radcliffe (see reference above) are at hand. The two largest ones apparently are not of this species and are described herein as representatives of a new species. The description is based on the specimen taken by the Mission, and two smaller ones, respectively 117 and 145 mm. (92 and 111 mm. to base of caudal) long, collected at Paita by R. E. Coker.

The two notably enlarged and strongly divergent spines at angle of preopercle, with one or two somewhat enlarged spines above and below them, seem to be characteristic of this species.

This fish does not grow large. The usual length probably is not much in excess of 200 mm. Although the report of the Mission (1943, p. 276) stated that it is regarded as a first-class fish, its commercial value seems to be small, as no landings were reported.

Range.—Coasts of Peru and Chile.

Genus PARANTHIAS Guichenot, 1868

Body elongate, compressed; head short; mouth moderately large; lower jaw projecting; maxillary rather broad; teeth in jaws in narrow bands, 2 to 4 of the outer ones in anterior part of each jaw somewhat enlarged, caninelike, fixed; villiform teeth on vomer and palatines; preopercular margin finely serrate, the serrae at angle little if at all enlarged, caninelike, fixed; villiform teeth on vomer and palatines; slender, about 25 on lower limb of first arch; lateral line complete; scales small, ctenoid on body, reduced and cycloid on head; dorsal with 9 spines, mostly of about the same height as the soft rays; caudal long, very deeply lunate; anal with 3 spines and 8 to 10 soft rays; ventral inserted just behind pectoral; pectoral long, rather pointed.

A single species is known from Peru.

PARANTHIAS PINGUIS Walford

Cabinsa

Paranthias furcifer Evermann and Radcliffe (not of Cuvier and Valenciennes), 1917, p. 78, Lobos de Afuera, Peru (synonymy; description).—Nichols and Murphy, 1922, p. 508, South Guañape Island, Peru (note).

Paranthias pinguis Walford, 1936, p. 2, Guaymas, Mexico (description; compared with "*P. furcifer*" from the Pacific coast, possibly from the Galápagos Islands); 1937, p. 118, pl. 64, fig. b (diagnosis).

Head 3.3; depth 2.8; D. IX, 20; A. III, 9; P. 20; scales 110.

Body moderately compressed, its greatest thickness a little less than half the depth; back rather high; profile anteriorly convex; caudal peduncle quite compressed, 2.6 in head; snout fairly pointed, 4.3; eye 6.6; interorbital 5.8; mouth oblique; lower jaw projecting, its tip entering dorsal outline; maxillary reaching a little beyond middle of eye, 2.6 in head; teeth in a narrow band in each jaw, a few of the outer ones in anterior part of each jaw slightly enlarged, fixed, small villiform teeth on vomer and palatines; preopercle with finely serrate margin, none of the serrae especially enlarged, anterior half of horizontal margin smooth; gill rakers slender, those at angle a little more than half length of eye, 26 more or less developed on lower and 12 on upper limb of first arch; scales small, ctenoid on body, greatly reduced and with smooth edges on head, small and more or less embedded on chest, present on maxillary; dorsal spines from the fourth to the ninth all of about equal length, of about the same height as the soft rays, the fourth 2.6 in head; tail very deeply lunate, the lobes pointed, the upper one longer than the lower, about equal to depth of body; anal spines moderately strong, the second stronger though not longer than the third, 2.8 in head; ventral inserted well behind base of pectoral, with a slender spine contained 2.2 in head; pectoral inserted about under origin of dorsal, somewhat pointed, the ninth ray (counting downward) the longest, 1.15 in head, 3.7 in length.

Color dark brown above, paler underneath; a series of 4 small dark spots on side above lateral line, the first one under middle of spinous dorsal and the last one on base of caudal, a few more indefinite spots on chest; fins of about the same color as adjacent parts of body.

"Color in life: Back and sides dark olive green, lighter on lower part of sides; ventral part of head, body, and peduncle a thin scarlet, deeper in places; small spots (about one-half diameter of pupil) irregularly disposed over posterior part of body; most of these spots white, some green; a green spot of same size on the flap just above insertion of pectoral; dorsal tipped with reddish; anal reddish, especially toward tip; caudal narrowly margined all around with reddish; ventral reddish, the exterior margin, including the spine, blue; a very pleasing fish in form and color" (Evermann and Radcliffe).

The description is based on the only specimen (U.S.N.M. No. 77653) in the collections from Peru. It is 190 mm. (137 mm. to base of caudal) long and was taken at Lobos de Afuera by R. E. Coker. I have identified it, together with numerous specimens from Panama Bay, with *P. pinguis* recently described from Guaymas, Mexico, by L. A. Walford, of which I have had the paratype (U.S.N.M. No. 101067) for comparison.[14]

Until Walford (1936, p. 2) described *P. pinguis*, all the representatives of the genus had for many years been regarded as of one species. I have now examined many specimens from Panama Bay and quite a few from the Galápagos Islands, besides the specimen from Peru and the paratype of *P. pinguis* from Guaymas, Mexico. I have also had two specimens from the West Indies for comparison. There certainly are two distinct forms on the Pacific coast, and possibly three. The single large specimen, the paratype of *P. pinguis*, 360 mm. long, is somewhat deeper than any other at hand. As it is much larger than other specimens examined, the largest of which is 255 mm. long, the difference may in part result from the greater age and size. I have, for the present, identified the Panama and Peruvian material as *P. pinguis*, where it may remain at least until more specimens become available from Mexico. For the specimens from the Galápagos Islands I am using the name *P. colonus* (Valenciennes, 1855, p. 300), originally described from those islands. Although the original description of this species is very brief, it states that there are 120 scales in a lateral series, which according to the present study is diagnostic. I am following the common practice of calling the West Indian specimens *P. furcifer* (Cuvier and Valenciennes, 1828, p. 261), originally described from Brazil. The West Indian and the Galápagos representatives certainly are more closely related than the mainland form of the Pacific coast. The species recognized may be identified from the following comparison:

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[14] Although Walford stated that *P. pinguis* has only about 76 scales in a lateral series, I am able to count 113 vertical series above the lateral line between the upper anterior angle of the opercle and base of caudal in the paratype. These series of scales can be seen rather clearly with a jeweler's glass if the fish is held at the proper angle in good light. Walford believed that the place of origin of the dorsal fin was a diagnostic character. This does not seem to be the case, however, as its place of origin varies among individuals. I am unable to use the color in identifying the long-preserved specimens studied.

Paranthias pinguis	*Paranthias colonus*	*Paranthias furcifer*
Scales rather large, 95 to 114 vertical series above lateral line and base of caudal, average 108.4 in 19 specimens; reduced in size on opercle; small and more or less embedded on chest.	Scales small, 118 to 130 vertical series above lateral line, average 124.2 in 17 specimens; reduced in size on opercle; small and more or less embedded on chest.	Scales small, 123 to 130 vertical series above lateral line (only 2 specimens at hand); not notably reduced in size on opercle; scarcely reduced on chest, and not embedded, the margins being free.
Depth 35 to 38 percent of length.	Depth 31 to 35 percent of length.	Depth 31.5 to 34 percent of length.
Depth of caudal peduncle 11.7 to 12.7 percent of length.	Depth of caudal peduncle 10 to 11 percent of length.	Depth of caudal peduncle 10.5 to 11.5 percent of length.
Snout 5.8 to 7.2 percent of length.	Snout 5.5 to 7.0 percent of length.	Snout 4.8 to 5.9 percent of length.
Caudal fin 26 to 28.5 percent of total length.	Caudal fin 25 to 30 percent of total length.	Caudal fin 23.5 to 25 percent of total length.
D. IX, 19 or 20 (rarely 21).	D. IX, 19 or 20 (rarely 21).	D. IX, 17 to 19.
A. III, 9 or 10.	A. III, 10.	A. III, 8 or 9.

It is stated in the report of the Mission (1943, p. 276) that the name "cabinsa" is used also for *Isacia conceptionis*, a species of the family of grunts, and that the two are not separated in the statistical reports. As the Mission apparently failed to take *P. pinguis*, and R. E. Coker took only one specimen, it probably is not numerous, and it may constitute an unimportant part of the commercial catch.

Range.—Gulf of California to northern Peru and the Galápagos Islands.

Genus RYPTICUS Cuvier and Valenciennes, 1829

Body elongate, compressed; head moderately small, pointed; mouth large, oblique; lower jaw projecting; maxillary rather long and broad, with a narrow supplemental bone; teeth all small, in bands on jaws, vomer, and palatines; opercle above posterior angle attached to shoulder by membrane; preopercle usually with 2 or 3 spines; opercle with 2 or 3 spines; gill rakers short and few; scales small, embedded; dorsal continuous, highest posteriorly, with 2 or 3 spines; caudal round; anal similar to posterior part of dorsal, without spines; ventral small inserted in advance of pectoral; pectoral moderate, round.

A single species, considered only subspecifically distinct from the common Atlantic coast *Rypticus saponaceus* by Schultz and Reid (1939, pp. 261–270), who revised the genus, is known from Peru.

RYPTICUS SAPONACEUS BICOLOR (Valenciennes)

Smecticus bicolor VALENCIENNES, 1855, p. 307, pl. 2, fig. 2 (original description).

Rypticus xanti MEEK and HILDEBRAND, 1925, p. 481, pl. 48, Panama Bay (description).

Rypticus nigripinnis MEEK and HILDEBRAND, 1925, p. 482, Panama Bay (description).

Rypticus saponaceus bicolor SCHULTZ and REID, 1939, p. 263 (synonymy; discussion; list of specimens examined).

Head 2.9 to 3.3; depth 3.1 to 3.75; D. II or III, 25 to 29; A. 17 or 18; P. 16 or 17; scales about 115 to 125 (too small to count accurately in the small specimens at hand; too deeply embedded in the large specimens to permit enumeration).

Body compressed, its greatest thickness not more than half its depth; back moderately elevated; profile from snout to nape nearly straight to gently convex; caudal peduncle quite compressed, 2.2 to 2.7 in head; snout pointed, 5.3 to 6.4; eye 5.5 to 8.0; interorbital very narrow, 12 to 16; mouth large, moderately oblique; lower jaw strongly projecting, nearly or quite entering dorsal profile; maxillary extending to or beyond posterior margin of eye, 2.15 to 2.7 in head; gill rakers short, only about 4 to 7 on lower, and generally only 1 or 2 on upper limb of first arch in addition to several very low rudiments on each limb; opercle with 3 spines, and the preopercle with 2 spines; lateral line complete, arched anteriorly, highest under dorsal spines, reaching middle of side over about middle of anal; scales small, elongate, shaped almost precisely like the sole of a sandal, without free edges, embedded, especially in adult; dorsal with 2 or 3 rather strong spines, scarcely longer than eye, the rays increasing gradually in length to about the fourth to sixth from end of fin, the base heavily enveloped in skin and flesh; caudal round; anal similar to posterior half or so of dorsal; ventrals small, close together, inserted well in advance of pectoral, about as long as snout and half the eye; pectoral moderately large, inserted well in advance of dorsal, broadly rounded, 1.4 to 1.8 in head, 4.3 to 5.3 in length.

Color dark brown. Young with a pale median band extending from snout to origin of dorsal, as wide as interorbital; two pale bands on side of head; lower part of head, and side everywhere, with irregular pale spots, those along middle of side more or less in rows; dots extending on base of all the fins exclusive of the ventrals; vertical fins darker than adjacent parts of body, each with a pale margin; ventral and pectoral only slightly dusky. Adult with irregular pale spots, much fewer and less conspicuous than in young; no pale streaks on head; fins all darker than adjacent parts of body, and none with pale margins.

The Mission secured five specimens, four of which are juveniles, only 32 to 55 mm. (24 to 41 mm. to base of caudal), and one large specimen 220 mm. (180 mm. to base of caudal) long. One juvenile was taken in the Gulf of Guayaquil, off Puerto Pizarro, and the rest in Lobos de Afuera Bay. The large specimen differs so much from the small ones, and from specimens from the Galápagos Islands, Panama, and Mexico, with which it was compared, that in my opinion it doubtfully belongs to the same species. It has a rather deeper, narrower body, a longer maxillary (extending well beyond the posterior margin of eye), and probably smaller scales, which are so deeply embedded that no accurate counts can be made. As Schultz and Reid (see references above), who made a special study of this genus, seem to have allowed for considerable variation within the Pacific coast subspecies this Peruvian specimen perhaps may also be included. Although *Rypticus* has been known from the Galápagos Islands a long time, it apparently has not been reported heretofore from the mainland south of Panama.

Range.—Baja California to the Galápagos Islands and northern Peru.

Family APOGONIDAE: Cardinalfishes

Body oblong or elongate; preopercle with two ridges; opercle with a single spine; branchiostegals six or seven; mouth large, more or less oblique; teeth villiform, occasionally enlarged, in bands on jaws, present also on vomer and sometimes on palatines;lower pharyngeals separate, with sharp teeth; lateral line complete; scales large, firm, usually ctenoid; dorsal fins well separated, the first with six to nine fairly strong spines; anal short, usually with two, occasionally three or four spines; ventrals thoracic, with I, 5 rays.

One genus is represented in Peru.

Genus APOGON Lacepède, 1802

Body oblong, compressed; head large; maxillary extending to or beyond middle of eye; villiform teeth present on jaws, vomer, and palatines; preopercular margin serrate; gill rakers fairly well developed, about 10 to 16 on lower limb of first arch; scales large, ctenoid; first dorsal with 6 or 7 spines; anal with 2 spines and 8 or 9 soft rays.

KEY TO THE SPECIES

a. A large black caudal spot present, sometimes obscure in large examples; no black bar under base of second dorsal; 11 or 12 (rarely 10) gill rakers, (exclusive of rudiments) on lower and 3 on upper limb of first arch; maxillary 1.8 to 1.9 in head------------------------------------ **dovii** (p. 194)

aa. Caudal spot wanting; a black bar present on side under second dorsal; 9 or 10 gill rakers, exclusive of rudiments, on lower and 2 (rarely 3) on upper limb of first arch; maxillary 1.95 to 2.05 in head----------- **parri** (p. 195)

APOGON DOVII Günther

Apogon dovii GÜNTHER, 1861, p. 371, Panama Bay (original description).—JORDAN and EVERMANN, 1896, p. 1108 (description; range).—MEEK and HILDEBRAND, 1925, p. 417, Panama Bay (synonymy; description; range).

Head 2.5 to 2.8; depth 2.75 to 3.2; D. VI–I, 9; A. II, 8; P. 11 or 12; scales 23 to 27; vertebrae 23 (one specimen dissected).

Body rather short, compressed, its greatest thickness fully equal to half the depth; dorsal outline anteriorly rather gently and evenly convex; caudal peduncle long, compressed, its depth 2.2 to 2.5 in head; head robust, compressed, its greatest thickness about equal to its depth at middle of eye; snout blunt, 4.0 to 5.0 in head; eye 2.8 to 3.3; interorbital 4.3 to 5.1; mouth rather large, slightly oblique, nearly terminal; maxillary scarcely reaching posterior margin of eye; 1.8 to 1.9 in head; teeth in each jaw in villiform bands, in an irregular series on vomer and palatines; opercle with an embedded spine; free edge of preopercle, above lower posterior angle mostly definitely serrate; gill rakers serrate along inner edge, 11 or 12 (rarely 10) developed on lower and 3 on upper limb of first arch, the rakers preceded on each limb by 2 to 4 thick, spiny tubercles; lateral line extending somewhat on base of caudal, following curve of back; scales very strongly ctenoid, extending on base of caudal, two complete rows between lateral line and base of first dorsal; spines of first dorsal moderately strong, the second and third, and sometimes the fourth, of about equal length, the longest 2.0 to 2.5 in head; origin of first dorsal over base of pectoral; second dorsal notably higher than the first, the anterior elevated lobe rather pointed, the longest rays often as long as head without snout; caudal concave, the lobes rounded; anal similar to second dorsal, its first spine very short, the second 2.4 to 3.0 in head, origin of fin slightly behind that of second dorsal; ventral inserted under base of pectoral, reaching vent and sometimes origin of anal; pectoral long, rounded, 1.4 to 1.6 in head.

Color of preserved specimens brownish above, pale underneath; chest silvery (almost wholly red in life); back and sides and sometimes the chest with dark punctulations; a black caudal spot present at all ages, though less distinct in large individuals; some individuals with a dark longitudinal band extending from eye to about opposite origin of anal, this band sometimes reduced to an obscure opercular spot; first dorsal partly dusky; produced parts of second dorsal and anal usually black distally, the rest of fin generally pale, the degree of pigmentation quite variable among individuals; caudal dusky to nearly black; ventral and pectoral pale, with or without dusky punctulations.

A. dovii is represented in the present collection by 46 specimens, 25 to 110 mm. (18 to 74 mm. to base of caudal) long. One is from Samanco Bay, and all the others were taken in Lobos de Afuera Bay. These specimens were compared with examples from Costa Rica, Panama Bay, and Cupica Bay, Colombia. The species apparently is new to the fauna of Peru.

This species is closely related to *A. retrosella* (Gill), known from the Gulf of California, where *A. dovii* also is said to occur. It differs from the latter in having a black half-bar under the base of the second dorsal, which is wanting in *A. dovii*. It differs, furthermore, in having finer and more numerous color markings on the lower parts of the head, and the eye is a little smaller (2.7 to 2.9 in head in *A. retrosella*). The constancy of the number of dorsal and anal rays in the two species discussed here, as well as in *A. parri*, is remarkable. In 21 specimens of *A. dovii*, 17 of *A. parri*, and 7 of *A. retrosella*, the number in the dorsal is constantly VI–I, 9, and that of the anal is II, 8 (the last partly divided ray having always been counted as 1).

Range.—Sinaloa (Mazatlán), Mexico, to (Samanco Bay) northern Peru. Heretofore reported only as far south as Panama Bay.

APOGON PARRI Breder

Amia retrosella Evermann and Radcliffe (not of Gill), 1917, p. 64, Lobos de Afuera, Peru.

Apogon parri Breder, 1936, p. 18, fig. 7, Cape San Lucas, Baja California (original description; eastern Pacific species differentiated in key).

Head 2.4 to 2.7; depth 2.9 to 3.2; D. VI–I, 9; A. II, 8; P. 12; scales 23 to 26; vertebrae 23.

Body moderately short, compressed, its greatest thickness rather less than half its depth; dorsal outline of head only slightly convex; caudal peduncle long, compressed, 2.35 to 3.0 in head; head compressed, its greatest thickness scarcely greater than its depth at anterior margin of eye; snout moderately blunt, 4.6 to 5.3 in head; eye 3.2 to 3.6; interorbital 4.75 to 6.75; mouth large, oblique, nearly terminal; maxillary not quite reaching opposite posterior margin of eye, 1.95 to 2.05 in head; teeth in jaws in villiform bands, those on vomer and palatines in an irregular series or in a very narrow band; opercle with an embedded spine, slightly free at tip; free edge of preopercle, above lower posterior angle, mostly very finely serrate; gill rakers definitely serrate along inner edge, 10 (rarely 9) developed on lower and only 2 on upper limb of first arch, the rakers preceded on each limb by 2 (rarely 3) spiny tubercles; lateral line extending on base of caudal, following curve of back; scales strongly but finely ctenoid, extending on base of caudal, two complete rows between lateral line and base of first dorsal; spines of first dorsal moderately strong, the second and third generally of about equal length, 2.3 to 2.7 in head; origin of first dorsal over base of pectoral; second dorsal notably higher than the first, the anterior elevated lobe pointed, the longest rays not quite so long as head without snout; caudal concave, the lobes rounded; anal similar to second dorsal, its first spine very short, the second 3.0 to 3.4 in head, origin of fin slightly behind that of second dorsal; ventral reaching to or beyond vent, but not quite to origin of anal; pectoral long, rounded, 4.0 to 4.2 in head.

Color of preserved specimens grayish brown above; pale underneath; chest silvery (almost wholly red in life); back and side almost everywhere with dusky punctulations; a black vertical bar under the third to fifth ray of second dorsal, extending down to about middle of side, not at all encroaching on fin; no caudal spot; a faint dark band on opercle, becoming narrower and more distinct in front of eye and extending around the snout; first dorsal mostly dusky; tip of anterior lobe of second dorsal black, the rest of fin pale; anal pale, the anterior lobe at the most only slightly dusky; caudal pale, or at the most with only a few dusky points; ventrals and pectorals pale.

The Mission furnished 14 specimens, 45 to 70 mm. (35 to 53 mm. to base of caudal) long, taken in Lobos de Afuera Bay and in Samanco Bay. Three additional specimens, respectively 70, 70, and 75 mm. long, collected at Lobos de Afuera by R. E. Coker, also are at hand. These are part of the specimens reported as *Amia retrosella* Gill, by Evermann and Radcliffe (see reference above). These specimens were compared with numerous examples from Acapulco, Mexico, and San Benito Island, Baja California, with which they seem to be specifically identical.

A. parri differs from *A. retrosella* (apparently known only from Baja California), with which it has been confused in collections, in color in the absence of a black caudal spot, and in the ending of the dark half-bar under the second dorsal without extending at all on the base of the fin. Structurally it differs in having a smaller eye, in having a rather shorter maxillary, and in having one to two fewer gill rakers on each limb of the first arch (eye 2.7 to 2.9; maxillary 1.7 to 1.9 in head; 11 or 12 rakers developed on lower limb, and three on upper limb of first arch in *A. retrosella*.

A. parri differs from *A. dovii*, with which it was taken in Peru, in the presence of the black bar under the second dorsal and in the absence of a caudal spot. Structurally it differs in having a slightly longer maxillary and also in having almost constantly one or two fewer gill rakers on each limb of the first arch.

Range.—Baja California to Peru. Not as yet reported from localities intermediate of Baja California and Peru.

Family MALACANTHIDAE: Matajuelos

Body elongate, fusiform or compressed; head usually rather short, with convex dorsal outline; cranial bones not cavernous; suborbital without bony stay; mouth moderate or small, terminal, little oblique; teeth fairly strong, upper jaw usually with a posterior canine; premaxillaries protractile; maxillary without supplemental bone, not slipping under preorbital; gills four, a slit behind the fourth; lateral line complete; scales small, ctenoid; dorsal fin long and low, usually continuous, the soft part longer and more developed than the spinous portion; anal fin long, its spines few and feeble; ventral thoracic with I, 5 rays; pectoral not very broad, the rays all or nearly all branched.

A single genus is included in the Peruvian collections studied. Some recent authors have divided the family Malacanthidae, as set up for example by Jordan and Evermann (1898, p. 2274). It seems advisable to me, however, to delay the divisions at least until the relationship of the genera of this general group is better understood. The discovery of a *Caulolatilus* with a nearly smooth preopercular margin seems to complicate the divisions further.

Genus CAULOLATILUS Gill, 1862

BLANQUILLOS

Body quite elongate, not strongly compressed, heaviest forward, tapering posteriorly; dorsal profile of head strongly convex; mouth moderate, generally terminal, little oblique; lips thick; maxillary not slipping under preorbital; teeth anteriorly in a band in each jaw, reduced to a single series laterally, the posterior teeth in each jaw generally caninelike; no teeth on vomer or palatines; preopercle usually serrate, occasionally nearly smooth; opercle with a flat spine; gill membranes connected, free from the isthmus; gill rakers short, rather stout; lateral line complete, concurrent with back; scales small, firm, ctenoid; dorsal fin long, continuous, with about 8 to 10 spines, and 22 to 26 soft rays; caudal deeply lunate to nearly straight; anal similar to soft part of dorsal, with 1 or 2 weak spines and about 20 to 25 soft rays; ventral thoracic; no adipose appendage at nape.

As far as known the species inhabit rocky bottom, apparently living principally about islands. All are valued as food. A commercial catch of "cabezudo" and "peje-blanco" of some importance was reported from Sechura, Cabo Blanco, Paita, and Talara by the Mission (1943, pp. 277, 280). Three species, one of which is new, come within the scope of this work.

KEY TO THE SPECIES

a. Head large and deep, with steep dorsal profile, 3.05 in length; preorbital broad (nearly as broad as eye in a specimen 270 mm. long); scales rather large, 110 in a lateral series, ctenoid on chest as elsewhere; dorsal with 23 soft rays; anal with 22; caudal only slightly concave---- **cabezon** (p. 198)

aa. Head smaller, more elongate, its dorsal profile not especially steep, 3.45 to 3.8 in length; preorbital much narrower; scales smaller, 116 to 128 in lateral series, smooth on chest; dorsal with 23 to 26 rays; anal with 23 or 24; caudal rather deeply lunate.

b. Margin of preopercle strongly serrate; maxillary not covered by upper lip; ventral inserted below base of pectoral--------------- **princeps** (p. 199)

bb. Margin of preopercle mostly entire, with only a few blunt serrae at angle; maxillary almost wholly covered by upper lip; ventral inserted a short distance behind base of pectoral------------ **affinis**, new species (p. 201)

CAULOLATILUS CABEZON Evermann and Radcliffe

PEJE-BLANCO; CABEZÓN; CABEZUDO

FIGURE 43

Caulolatilus cabezon EVERMANN and RADCLIFFE, 1917, p. 111, pl. 10, fig. 3, Chimbote and Paita, Peru (original description; compared with *C. princeps*).

Head 3.05; depth 3.1; D. VIII, 23; A. II, 22; P. 18; scales 110.

Body rather elongate, compressed, deepest over base of ventrals, tapering posteriorly, its greatest thickness equal to about half its depth; profile anterior to dorsal fin definitely convex, steep over snout; caudal peduncle short, compressed, 3.4 in head; snout blunt, 2.8; eye 4.2; interorbital 4.5; preorbital nearly as broad as eye; mouth rather large, terminal, slightly oblique; maxillary not covered by upper lip, reaching a little beyond vertical from anterior margin of eye, 2.5 in head; teeth in a band anteriorly in each jaw, reduced to a single series posteriorly, the last 2 or 3 teeth enlarged; vertical margin of preopercle strongly serrate; gill rakers at angle scarcely as long as pupil, 15 on lower and 9 on upper limb of first arch; lateral line complete, only slightly arched; scales rather small, firm, ctenoid, ctenoid on chest as elsewhere, extending forward on posterior part of interorbital, present on cheek and opercle, covering lower two-thirds of dorsal, extending slightly on bases of ventral and pectoral, but not on dorsal or anal; dorsal fin long, continuous, the spines sharp, slender, increasing very gradually in length from the third to the last, the first two being notably shorter, the longest one 3.25 in head; soft part of fin higher than spinous part, highest posteriorly, the second and third rays from end of fin produced, reaching base of caudal; caudal only slightly concave, both lobes acute, the upper one slightly the longer; anal very similar to soft part of dorsal (although originally described as having only one spine, it more properly should be described as having two, the second one being tipped by a short filament), base of fin 2.4 in length; ventral inserted under base of pectoral, pointed, 1.75 in head; pectoral moderately long, pointed, the seventh ray (counting downward) longest, 1.3 in head, 4.0 in length.

Color of old preserved specimen uniform brownish above, pale underneath; dorsal and caudal brown; other fins lighter; axil of pectoral dark brown, this color extending somewhat on inner surface of fin.

The description is based on the type (U.S.N.M. No. 77654) from Chimbote, the only specimen at hand, which is now 270 mm. (220 mm. to base of caudal) long. Evermann and Radcliffe (see reference above) recorded a paratype from Paita, 310 mm. long, which I have not seen. This species has a larger, deeper head, with a steeper and more strongly convex dorsal profile than *C. princeps*. It also has a deeper cheek, and broader preorbital; differences most evident if specimens of about equal size are compared. The scales are rather larger, and ctenoid (instead of smooth) on chest; the number of soft rays in the dorsal and anal are slightly fewer; and the caudal fin is notably less deeply concave.

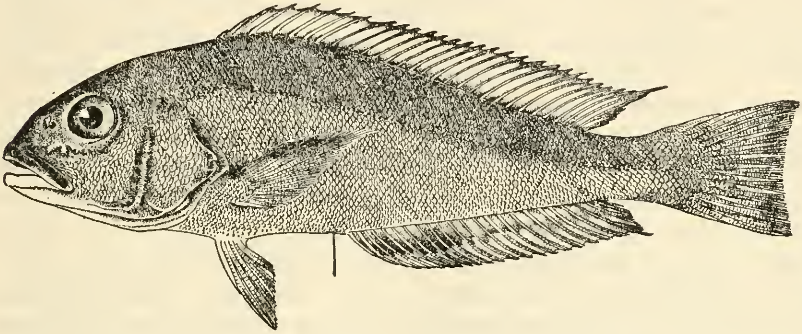

FIGURE 43.—*Caulolatilus cabezon* Evermann and Radcliffe. From the type, 270 mm. long, Chimbote, Peru (U.S.N.M. No. 77654). (After Evermann and Radcliffe, 1917.)

Range.—Known only from Chimbote and Paita, Peru.

CAULOLATILUS PRINCEPS (Jenyns)

PEJE-BLANCO; PEJE-FINO

Latilus princeps JENYNS, 1842, p. 52, pl. 11, Chatham Island, Galápagos Archipelago (original description).

Caulolatilus princeps STEINDACHNER, 1902, p. 123, Callao, Peru (description).—STARKS, 1906, p. 799, Callao, Peru.— EVERMANN and RADCLIFFE, 1917, p. 110, Lobos de Afuera, Callao, and Pisco, Peru (synonymy; description; range).— NICHOLS and MURPHY, 1922, p. 510, Chincha Island, Pescadores Island, and South Guañape Island, Peru (notes).

Head 3.45 to 3.8; depth 2.55 to 3.8; D. VIII or IX, 23 to 26; A. II, 23 or 24; P. 19; scales 116 to 128; vertebrae 27 (one specimen dissected).

Body quite elongate, compressed, generally deepest over insertion of ventrals, tapering posteriorly, its greatest thickness usually exceeding half its depth; profile anterior to dorsal fin quite convex, rather steep over snout and eyes; caudal peduncle short, compressed, 3.1 to

3.5 in head; snout fairly blunt, 2.8 to 3.4; eye 3.8 to 4.6; interorbital 3.3 to 4.3; preorbital much narrower than eye, even in the largest specimen at hand; mouth moderate, terminal, nearly horizontal; maxillary not covered by upper lip, reaching to or somewhat beyond anterior margin of eye, 2.85 to 3.2 in head; teeth in a band anteriorly, reduced to a single series posteriorly in each jaw, the last tooth in upper jaw notably enlarged, usually pointed, occasional molarial, many of the teeth blunt in some specimens, nearly all pointed in others; vertical margin of preopercle sharply serrate; gill rakers at angle scarcely as long as pupil, 12 to 15 on lower and 6 to 10 on upper limb of first arch; lateral line complete, scarcely arched; scales small, firm, ctenoid, becoming smooth on chest, extending forward to posterior part of interorbital, present on cheek and opercle, covering most of caudal fin, also extending slightly on bases of ventral and pectoral, but not on dorsal or anal; dorsal fin long, continuous, the spines sharp, slender, increasing gradually in length from the third to the last one, the longest one 2.7 to 3.1 in head; soft part of fin rather higher, the rays increasing gradually in length, the third from end of fin usually somewhat produced, often reaching base of caudal; caudal deeply lunate in the larger specimens, less so in a small one, the lobes pointed, the upper one the longer; anal very similar to soft part of dorsal, its base 2.35 to 2.5 in length; ventral inserted under base of pectoral, pointed, 1.6 to 1.8 in head; pectoral moderate, pointed, the seventh or eighth ray (counting downward) longest, 1.2 to 1.25 in head 4.1 to 4.5 in length.

Color uniform, rather dark brown above to pale grayish brown underneath; dorsal and caudal fins brown; other fins pale in a small specimen, more or less dusky in the larger ones; axil of pectoral and inner surface of this fin largely dark.

The Mission obtained two specimens, one in Chimbote Bay and the other one at Pachacamac Island. There are at hand also two specimens from Callao (U.S.N.M. No. 53476) collected by P. O. Simons and one from Callao (U.S.N.M. No. 77616) taken by R. E. Coker. The specimens listed, which range from 170 to 315 mm. (137 to 256 mm. to base of caudal) in length, form the basis for the foregoing description. These specimens were compared with two others from the Galápagos Islands, and eight from off the coast of California.

The wide variation in the number of scales in the lateral series, which ranges from 116 to 128 (116 once, 118 once, 123 once, 125 once, 127 twice, and 128 once) in the southern material (including Galápagos Islands specimens), and from 125 to 134 (125 once, 127 once, 128 once, 129 once, 130 twice, 133 once, and 134 once) in the northern specimens, is striking. As the scales are in rather regular series, the enumerations are fairly accurate. Accordingly, the specimens with the rather large scales were carefully compared with those having very small scales, with the view of finding other differences if they existed. However, none was found. The specimens from California, as indicated, have rather smaller scales than the southern material, though the numbers overlap. As no differences in support of the smaller scales were found, that character is regarded as of no specific significance. In one specimen from Callao 116 scales were counted, and 123 in another one from the same place, collected at the same time. A wide variation among individuals in the number of scales present, therefore, seems to exist within this species.

Range.—California, Baja California, Peru, and the Galápagos Islands. Not yet recorded from intermediate localities.

CAULOLATILUS AFFINIS, new species

PEJE-BLANCO

FIGURE 44

Head 3.6; depth 3.55; D. IX, 26; A. II, 24; P. 19; scales 125.

Body rather elongate, compressed, deepest over base of ventrals, tapering rather strongly posterior to origin of anal, its greatest thickness about two-thirds its depth; profile anterior to dorsal convex, not especially steep over snout and eyes; caudal peduncle short, compressed, 3.3 in head; snout only moderately blunt, 2.8; eye moderate, the surrounding membrane covering upper anterior portion of eye (more so than in related species), 4.2 in head; interorbital 2.75; preorbital notably narrower than eye; mouth rather small, slightly oblique, terminal; maxillary, except for a small section, covered by the upper lip, reaching nearly or quite to vertical from anterior margin of eye, 2.6 in head; teeth in each jaw in a band anteriorly, reduced to a single series posteriorly, the last tooth in upper jaw enlarged, the teeth apparently rather larger than in related species; vertical margin of preopercle mostly with a smooth, bony margin, a few short blunt serrae at angle; gill rakers at angle somewhat shorter than pupil, 15 on lower and 7 on upper limb of first arch; lateral line complete, only slightly arched; scales small, firm, ctenoid, becoming smooth on chest, extending forward on posterior part of interorbital, present on cheek and opercle, covering caudal fin except distally, extending on base of pectoral, scarcely on base on ventral, and not at all on dorsal or anal; dorsal long, continuous, the spines sharp, slender, rather short, increasing very gradually in length from the third to the last, the longest one 2.6 in head; soft part of fin rather notably higher than spinous part, highest posteriorly, the third ray from the end of fin produced, reaching base of caudal; caudal rather deeply lunate, several of the middle rays of about the same length, the lobes acute, curved inward, the upper one slightly the longer; anal very similar to soft part of dorsal, its base 2.4 in length; ventral inserted behind base of pectoral a distance about equal to diameter of pupil, pointed, 1.55 in head; pectoral long, reaching well beyond tip of ventral, about opposite origin of anal, the seventh and eighth rays longest (counting downward), as long as head, 3.65 in length.

Color uniform brown above shading into pale brown underneath; fins mostly dusky brown; anal fin notably darker than adjacent parts of body; inner surface of pectoral much darker than the exposed surface, lower part of fin rather pale.

The description is based on a single specimen (U.S.N.M. No. 128051), 285 mm. (230 mm. to base of caudal) long, taken with a trammel net set over rocky bottom in Lobos de Tierra Bay. This specimen, which was furnished by the Mission, apparently is not identifiable with any known species and accordingly becomes the type of a new species. It is characterized by the absence of serrae on the preopercular margin, except for a few blunt points at angle; the ventral fins are inserted distinctly behind bases of pectorals, instead of below them as in the other local species; the pectoral fins are longer, being as long as the head; the maxillary is almost wholly covered by the lip, whereas it is above the lip in related species; the head is lower, and its upper profile is less steep, especially over snout and eyes; and the caudal is differently shaped, the outer rays being curved inward, and its posterior margin is more evenly lunate than in *C. princeps*, and more deeply concave than in *C. cabezon.*

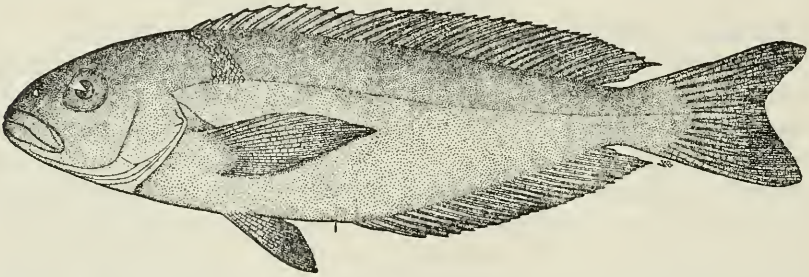

FIGURE 44.—*Caulolatilus affinis*, new species. From the type, 285 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 128051).

Range.—Known only from Lobos de Tierra Bay, Peru.

Family CARANGIDAE: Cavallas; Pámpanos

Body elongate to ovate, moderately to very strongly compressed; occipital region usually with a compressed edge or keel; mouth variable; premaxillaries usually protractile; maxillary with or without a supplemental bone; teeth usually small, in one or a few series, rarely in a narrow band in each jaw, occasionally wholly wanting in adults; gills four, a slit behind the fourth; branchiostegals commonly seven;

pseudobranchiae generally large, occasionally lost with age; lateral line usually with an arch anteriorly, the straight part generally, and the curved section rarely, armed with bony scutes; scales small, sometimes embedded, and occasionally obsolete; anal fin similar to second dorsal, sometimes much shorter, preceded by two strong spines, generally separate and free or rarely obsolete in adults; ventral fins thoracic, with I, 5 rays.

KEY TO THE GENERA

a. Dorsal and anal each followed by nearly or fully detached finlet; body quite elongate, its depth generally less than a fourth of its length.
  b. Straight part of lateral line with bony scutes; finlet of dorsal and of anal rather remote from fins; pectoral short------------ **Decapterus** (p. 204)
  bb. Lateral line throughout with prominent bony scutes; finlet of dorsal and of anal close behind the fins or more or less attached by membrane; pectoral long and falcate in adults------------------------ **Trachurus** (p. 205)
aa. Dorsal and anal without finlets; body variously shaped, generally deeper.
    c. Body more or less elongate (sometimes ovate in *Trachinotus*); depth usually less than half the length; forehead not extremely steep, its outline continuous with curve of back, not forming an angle.
      d. Premaxillaries protractile; ventral fin not attached to abdomen by membrane; lateral line with or without bony scutes.
        e. Anal and second dorsal of nearly equal length; pectoral long and falcate in adults, except in *Trachinotus*.
          f. Back notably elevated; dorsal outline generally more strongly convex than ventral outline; mouth horizontal to little oblique.
            g. Body moderately elongate; straight part of lateral line, posteriorly at least, with bony scutes; maxillary moderately broad to very broad, with a distinct supplemental bone.
              h. Teeth in jaws uneven, in one or a few rows, usually present on vomer, palatines, and tongue; second dorsal and anal more or less elevated anteriorly, without a conspicuous sheath at base------------------------- **Caranx** (p. 208)
              hh. Teeth in jaws in a single, even, close-set row, none on vomer, palatines, and tongue; second dorsal and anal with a broad conspicuous sheath at base--------- **Hemicaranx** (p. 211)
            gg. Body quite deep; no bony scutes in lateral line; maxillary very narrow, without a distinct supplemental bone. **Trachinotus** (p. 213)
          ff. Back scarcely elevated; dorsal outline much less strongly convex than ventral outline; mouth nearly vertical; pectoral long, falcate---------------------------- **Chloroscombrus** (p. 216)
        ee. Anal much shorter than second dorsal; no bony scutes in lateral line; pectoral short--------------------------------- **Seriola** (p. 218)
      dd. Premaxillaries not protractile; ventral more or less attached to abdomen by membrane; no bony scutes in lateral line.
        i. First dorsal with 7 or 8 spines; anal much shorter than second dorsal; no teeth on vomer, palatines, or tongue, those on jaws in a single series---- ----------------------- **Neptomenus** (p. 220)
        ii. First dorsal with 3 to 5 spines; anal and second dorsal about equal in length; teeth present on vomer, palatines, and tongue, those on jaws in bands------------------------- **Oligoplites** (p. 221)

cc. Body excessively deep, ovate, extremely compressed; forehead very steep to nearly vertical, its outline forming an obtuse angle with that of back; depth usually greater than half length.

j. Anterior profile nearly vertical, more or less concave; chord of arch in lateral line shorter than straight part, posteriorly with small bony scutes; second dorsal and anal never with high lobes anteriorly. **Vomer** (p. 222)

jj. Anterior profile never vertical, scarcely if at all concave; chord of arch in lateral line equal to or longer than straight part, without bony scutes; second dorsal and anal with high lobes anteriorly in adults. **Selene** (p. 223)

Genus DECAPTERUS Bleeker, 1851

Body rather elongate, little compressed; head rather short, moderately pointed; mouth fairly small, nearly or quite terminal; premaxillaries protractile; maxillary broad, with a supplemental bone; straight part of lateral line, posteriorly, armed with bony scutes; second dorsal and anal each with a well-detached finlet; pectoral short.

A single species is known from Peru.

DECAPTERUS AFUERAE, new species

JUREL FINO

Decapterus scombrinus EVERMANN and RADCLIFFE (not of Cuvier and Valenciennes), 1917, p. 58, Lobos de Afuera, Peru (description; relationship discussed).

?*Decapterus sanctae-helenae* WALFORD (not of Cuvier and Valenciennes), 1937, p. 82, pl. 7, fig. C.

Head 3.75; depth 4.7; D. VIII–I, 32–I; A. II–I, 27–I; P. 20 or 21.

Body rather robust, its greatest thickness about two-thirds the depth; back little elevated; caudal peduncle depressed, its depth 7.8 in head; head low; snout somewhat pointed, 3.35 in head; eye 4.25; interorbital 4.1; mouth oblique; lower jaw projecting somewhat; maxillary broad, with a concave posterior margin, scarcely reaching anterior margin of eye, 3.1 in head; teeth in upper jaw obsolete, a series of small teeth in lower jaw, vomerine patch with a long backward extension, palatine bands very narrow; shoulder girdle with a pronounced notch and a prominent projection above it midway between pectoral and ventral; gill rakers slender, about two-thirds length of eye, 33 on lower and 10 on upper limb of first arch and with 17 spiny knobs on its inner side; lateral line with a long, low curve anteriorly, becoming straight approximately over origin of anal, the chord of the curved part much longer than the straight part, provided with modified scales throughout, becoming hard and bony (scutes) posteriorly, 73 scales, followed by 32 scutes, each 35 with a rather definite spine; scales missing on top of head anterior to postorbital margins, and on snout, with a narrow strip of 3 or 4 rows of scales on cheek; spines of first dorsal slender, the fourth the longest, failing to reach origin of second dorsal by fully half diameter of eye, nearly as long as postorbital part of head; second dorsal and anal about equally elevated anteriorly, the longest ray in dorsal a little longer than snout; anal shorter than second dorsal, its origin fully length of snout behind that of second dorsal, coterminal with the latter; ventral small, inserted a little behind base of pectoral, reaching notably less than halfway to vent, 2.4 in head; pectoral somewhat damaged, short, not falcate, about 6.3 in length.

"Color in alcohol, dusky blue on back becoming silvery, tinged with yellow on belly; fins dusky; a dark area at tip of opercle and in axil of pectoral" (Evermann and Radcliffe).

The Mission did not secure this species. The description is based on the type, about 285 mm. (240 mm. to base of caudal) long (U.S.N.M. No. 77733), taken at Lobos de Afuera by R. E. Coker. It differs in the lower position of the notch on shoulder girdle and in the absence of scales on the interorbital from specimens from the Galapagos Islands, Baja California, Hawaii, Japan, and the Atlantic.

Range.—Northern Peru and probably to Baja California.

Genus TRACHURUS Rafinesque, 1810

Body rather elongate, more or less compressed; back little elevated; head moderately pointed; lower jaw projecting; premaxillaries protractile; maxillary rather broad, with a supplemental bone; teeth small, mostly in a single series in each jaw, present also on vomer, palatines, and tongue; gill rakers fairly numerous, slender, about 35 to 50 on lower limb of first arch; lateral line with a long, low arch anteriorly, armed with bony scutes throughout its length, only those of straight part with a spine; an accessory dorsal branch of lateral line present; first dorsal composed of slender spines connected by membranes; second dorsal and anal similar, the last ray of each nearly or quite separate in adults (and apparently may be correctly indicated in a fin-ray formula either as connected or separate); pectoral long, falcate in adults.

A single species seems to occur on the coast of Peru.[15]

---

[15] Tschudi (1845, p. 19) described a slender fish from Peru under the name *Caranx peruanus*. I am unable to determine its relationship from the description. However, the proportions of depth to length, given as "1:6.5" is about correct for large specimens of *T. murphyi* Nichols (the length of the fish described being stated as "2′6″", presumably meaning 2 feet 6 inches). The number of rays for the dorsal fins, given as "IX–I, 28," is nearly correct for *T. murphyi*, when it is assumed that the procumbent spine was included, and the number of anal rays, stated as "II, 28," too is correct, if it is assumed that the third spine was counted with the soft rays. The number of pectoral rays, "20," is correct, and the count of "I, 10" ventral rays may be dismissed as an error. The head according to the proportion given, "1–3" in length of body, is much too great for large specimens of *Trachurus* at hand. The large eye, projecting lower jaw, and the minute teeth are all described as in agreement with Peruvian specimens now at hand. The lateral line, too, is described approximately as in specimens before me, except that no bony scutes are mentioned for its curved part. The last ray of the second dorsal, as well as that of the anal, is described as composed of five or six rays, bound together and forming a pencil-shaped fin. This character strongly suggests *Trachurus*. The author, finally, stated that the species is fairly common along the entire coast of Peru. If the fish described as *Caranx peruanus* by Tschudi should prove to be a *Trachurus*, which seems highly probable to the writer, *peruanus* very probably would have to replace *murphyi*.

TRACHURUS MURPHYI Nichols

JUREL; JUREL CITO

FIGURE 45

Trachurus symmetricus EVERMANN and RADCLIFFE (probably not of Ayres), 1917, p. 59, pl. 5, fig. 2, Lobos de Afuera and Callao, Peru (description; discussion of species of the genus; range).

Trachurus murphyi NICHOLS, 1920, p. 479, Central Chincha Island, Peru (diagnosis; range; key to the species).—NICHOLS and MURPHY, 1922, p. 508, North Chincha Island, and Central Chincha Island.

Head 5.6 to 5.8; depth 6.5 to 7.0; D. VIII–I, 30 to 33–I; A. II–I, 25 to 27–I; P. 21 to 23.

Body of large specimens rather robust, round, its greatest thickness equal to about two-thirds of its depth (deeper and more compressed in young); dorsal profile similar to ventral profile, gently convex; caudal peduncle depressed, its depth 8.4 to 9.4 in head; head more strongly compressed than anterior part of body; snout fairly pointed, 3.25 to 3.4 in head; eye 4.3 to 4.9; interorbital 4.0 to 4.6; mouth oblique, with lower jaw projecting rather strongly; maxillary rather broad, with a narrow supplemental bone, with straight or slightly concave posterior margin, extending nearly to pupil, 2.6 to 2.8 in head; teeth very small, pointed, mostly in a single series on jaws, present also on vomer, palatines and in a long narrow band on middle of tongue; gill rakers slender, becoming very short at each end of the arch, the longest ones about two-thirds length of eye, 45 to 48 on lower and 15 to 17 on upper limb of first arch; lateral line strongly decurved under anterior part of second dorsal, the chord of the curved part and the straight part of about equal length, entire lateral line armed with bony scutes, only those in straight part with spines, the deepest scutes of each section of the lateral line of about equal depth, those of curved part 5.0 to 5.9 in head, and those of straight part 5.3 to 6.2, total number of scutes in lateral line 93 to 104; accessory branch of lateral line ending under anterior part of second dorsal; scales covering entire body, and most of head exclusive of snout; first dorsal with flexible spines, con-

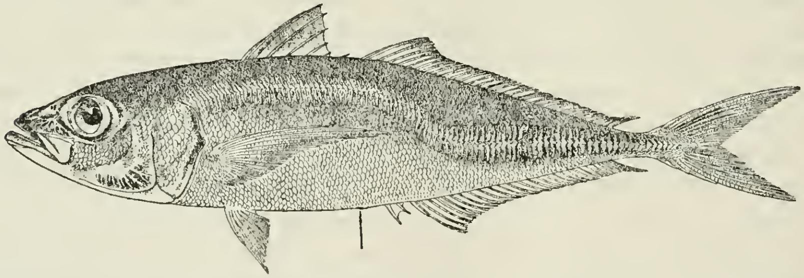

FIGURE 45.—*Trachurus murphyi* Nichols. From a specimen 440 mm. long, Callao, Peru (U.S.N.M. No. 77684). (After *T. symmetricus* Evermann and Radcliffe, 1917.)

nected by membrane, the third and fourth longest, scarcely as long as snout and eye, reaching origin of second dorsal if deflexed; second dorsal and anal similar, each with an elevated lobe anteriorly, the longest rays of dorsal about equal to postorbital part of head, each with a detached finlet; origin of anal nearly an eye's diameter behind that of second dorsal, the two fins coterminal; ventral fairly narrow, inserted under or more usually slightly behind base of pectoral, 1.9 to 2.0 in head; pectoral long, falcate, reaching about opposite origin of anal, 4.9 to 5.2 in length.

Color bluish gray above; this color merging gradually into the pale silvery of the lower parts; a dark spot on margin of opercle above its posterior angle; ventral and anal pale; other fins more or less dusky; axil of pectoral and inner surface of gill covers black.

The foregoing description is based on seven rather large specimens, 555 to 565 mm. (485 to 497 mm. to base of caudal) long, which were taken with hook and line at Callao and San Lorenzo Island. Some small specimens, 73 to 150 mm. (60 to 117 mm. to base of caudal) long, from Lobos de Afuera and Callao, collected by R. E. Coker, also are on hand. The enumerations based on the small specimens come within the scope of the larger ones. However, the proportions, especially as to the length of the head and depth of the body, differ so greatly that it has seemed desirable to list them separately. Head in length 3.3 to 3.5; depth 4.5 to 4.8; pectoral 3.85 to 4.3. Eye in head 3.35 to 3.6; snout 3.35 to 3.6; interorbital 4.3 to 4.6; maxillary 2.6 to 2.8; caudal peduncle 8.25 to 9.0; deepest scute in curved part of lateral line 5.7 to 6.3, in straight part 4.7 to 6.3; ventral 1.85 to 2.0. It is evident from the proportions that the body is deeper in the young, in which it also is much more compressed. This character, then, is not of much value in separating species, unless specimens of equal length are compared. The scutes in the lateral line already are well developed in the smallest specimen, and the pectoral fin although proportionately shorter already is long and somewhat falcate. The procumbent spine of the dorsal, which is more or less embedded in large specimens, is free and sharp in the young, and the two anterior anal spines already are free and detached from each other.

Although I am unable to use Nichols's key (1920, p. 481) in separating this apparently valid species from *T. symmetricus* (Ayers), from California, other characters do seem to distinguish it. First, and apparently most important, the southern species, *T. murphyi*, has a few more gill rakers on the lower limb of the first arch, 45 to 48, whereas the northern species, *T. symmetricus*, has only 40 to 42 (counted in six specimens from California). Second, the scutes in the lateral line are deeper and more prominent in Peruvian fish, the deepest in the curved and straight parts of the lateral line being of about equal depth, whereas those in the curved part are narrower in

California fish. The depth of the deepest ones in the curved section in Peruvian examples is 5.0 to 5.9 in head, and that of deepest in the straight part is contained 5.3 to 6.2 in head. In California fish the proportions given in the same order are 8.4 to 9.5, and 6.7 to 7.9. The scutes appear to be about equal in number in the two species. No comparisons with specimens from other localities have been made.

The "jurel" is mentioned among the commercial fishes in the report of the Mission (1943, p. 273) as of some importance, especially in southern Peru.

Range.—Coast of Peru. Specimens of the genus reported from Chile and the Galápagos Islands probably also are of this species.

Genus CARANX Lacepède, 1802

Body elongate to rather short and deep, compressed; dorsal profile gently to strongly convex; head rather large, compressed, usually blunt; mouth moderate or large, usually terminal; premaxillaries protractile; maxillary rather broad, with a rather large supplemental bone; teeth in jaws more or less unequal, in one or a few series, usually present also on vomer, palatines, and tongue, wanting in large examples of some species; gill rakers fairly long, generally about 12 to 35 on lower limb of first arch; lateral line with an arch anteriorly, the straight part at least posteriorly armed with bony scutes; first dorsal with rather slender spines; second dorsal and anal similar, generally more or less elevated anteriorly; caudal strongly forked; pectoral long, and usually falcate in adults.

Two species come within the scope of the present work.

KEY TO THE SPECIES

a. Body rather deep, with a high anterior profile, its depth 2.5 to 3.0 in length; gill rakers 15 or 16 on lower limb of first arch; chest almost wholly devoid of scales--**hippos** (p. 208)

aa. Body rounder and more elongate, with a low anterior profile, its depth 3.6 in length; gill rakers 28 on lower limb of first arch; chest completely covered with scales-----------------------------------**caballus** (p. 209)

CARANX HIPPOS (Linnaeus)

COCINERO

Scomber hippos LINNAEUS, 1766, p. 494, Charleston, S. C. (original description).

Caranx hippos JORDAN and EVERMANN, 1896, p. 920, fig. 387 (description; distribution; synonymy).—MEEK and HILDEBRAND, 1925, p. 350; Panama, both coasts (synonymy; descriptions; specimens from opposite coasts compared; range).

Caranx caninus WALFORD, 1937, p. 72, pl. 51, fig. a, in color (diagnosis; compared with *C. hippos* of the Atlantic, which was considered distinct; habits).

Head 3.1 to 3.25; depth 2.5 to 3.0; D. VIII–I, 20 or 21; A. II–I, 17 or 18; P. 19 or 20; scales about 130, too small and irregular to enumerate accurately.

Body robust; dorsal profile anteriorly very strongly convex, with a low carinate edge over posterior part of head, ventral profile anteriorly only slightly convex; head deep, compressed; snout moderately blunt, 3.6 to 3.75 in head; eye 4.25 to 5.5; interorbital 3.5 to 4.0; mouth a little oblique; lower jaw slightly projecting; maxillary broad, fully three-fourths width of eye, 2.2 to 2.4 in head; teeth in upper jaw in a narrow band, with some enlarged teeth on outer side of band in front, those of lower jaw mostly in a single series, some of the anterior ones enlarged; gill rakers compressed, dentate along inner edge, a little shorter than eye, 15 to 16 on lower and 3 on upper limb of first arch; lateral line with a long arch anteriorly, its chord only a little shorter than straight part, 2.6 to 3.3 in length, straight part with about 36 to 39 bony scutes, becoming quite strong on caudal peduncle; scales extending forward in parietal region and on cheek, absent on chest except for a triangular patch in front of ventrals; first dorsal with rather slender spines, mostly connected by membranes, the fourth the longest, about as long as snout, its origin about an eye's diameter behind base of pectoral; second dorsal and anal similar, the anterior lobes reaching little beyond middle of bases of fins, the origin of anal about an eye's diameter behind that of dorsal, coterminal, base of anal (exclusive of free spines) 3.0 to 3.4 in length; ventral moderately small, inserted a little behind pectoral, 2.3 to 2.4 in head; pectoral long, falcate, reaching well beyond origin of anal, 2.6 to 3.1 in length.

Color grayish green along back, this color merging into the golden yellow and silvery of the lower parts; a small specimen with five pale bars on side, these faintly visible in one large specimen; a prominent black spot on opercle near upper angle; dorsal, caudal, and anal all more or less dusky; ventral pale; pectoral pale except for a dark blotch on its lower ray, and a black axil.

The Mission secured three specimens, respectively 185, 395, and 445 mm. (145, 304, and 342 mm. to base of caudal) long. The largest one was caught on a trolling line in the Gulf of Guayaquil, off Picos Point, and the others were seined at Lobos de Tierra Island. This species, which apparently has not previously been recorded from Peru, evidently is not numerous enough there to enter commerce.

Range.—Both coasts of tropical America, as here understood; on the Pacific from the Gulf of California to Peru.

CARANX CABALLUS Günther

FIGURE 46

Caranx caballus GÜNTHER, 1869, p. 431, Panama Bay (description).—EVERMANN and RADCLIFFE, 1917, p. 61, pl. 5, fig. 3, Lobos de Tierra, Peru (synonymy; description, based on a Peruvian specimen; range).—MEEK and HILDEBRAND, 1925, p. 359, pl. 28, Panama Bay (synonymy; description; compared with *C. crysos* of the Atlantic; range).—WALFORD, 1937, p. 73, pl. 51, fig. b, in color (diagnosis; range).

Head 3.6; depth 3.6; D. VIII–I, 23; A. II–I, 20; P. 20.

Body rather round, less compressed than in related species; dorsal outline slightly more convex anteriorly than the ventral, with a slightly compressed edge over occipital region; head rather low, moderately compressed; snout fairly long, 3.4 in head; eye 5.75; interorbital 3.1; mouth rather large, oblique; lower jaw projecting slightly; maxillary fully three-fourths as broad as eye, 2.6 in head; teeth small, those in upper jaw in a band, a few of them slightly enlarged, in a single series in lower jaw; gill rakers slender, about as long as eye, 28 on lower and 10 on upper limb of first arch; lateral line with a long low curve, descending rather abruptly under origin of second dorsal, the chord of curved part a little more than half the length of the straight part, 4.0 in length, scutes mostly quite strong, 45 more or less developed; scales extending forward in parietal region, and on cheek, covering entire chest; first dorsal composed of fairly strong spines, connected by membranes, the fourth the longest, about as long as snout and half the eye, origin of fin approximately an eye's diameter behind base of pectoral; second dorsal and anal similar, somewhat elevated anteriorly, the lobe of second dorsal scarcely longer than longest spine of first dorsal, origin of anal an eye's diameter behind that of second dorsal, the fins coterminal; base of anal (exclusive of free spines) 2.8 in length; ventral moderately small, inserted immediately behind pectoral, 2.5 in head; pectoral long and falcate, extending well beyond origin of anal, 2.9 in length.

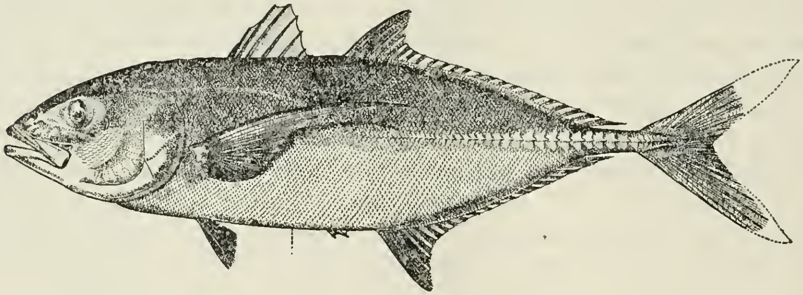

Figure 46.—*Caranx caballus* Günther. From a specimen 420 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77701). (After Evermann and Radcliffe, 1917.)

"Color in alcohol, dusky blue or green on back; belly silvery tinged with golden; a black area on posterior border of opercle above base of pectoral; axil of pectoral black; fins dusky" (Evermann and Radcliffe). The color of the specimen described has now faded to a grayish brown above and yellowish underneath.

The Mission did not obtain this species. The description is based on the specimen described by Evermann and Radcliffe (see reference above), secured at Lobos de Tierra by R. E. Coker. The total length given by Evermann and Radcliffe was 420 mm. (caudal fin now broken); present length to base of caudal, 325 mm. It agrees well with specimens from Panama. Its roundish body and numerous gill rakers distinguish it from related species.

Range.—Known from San Pedro, Calif., to Lobos de Tierra, Peru.

Genus HEMICARANX Bleeker, 1862

Maxillary narrow; teeth in each jaw in a single close-set series, few or none on vomer, palatines, and tongue; second dorsal and anal without evident lobes anteriorly, each with a broad conspicuous sheath at base. Other characters are essentially as in *Caranx*.

A single species, which apparently has not been described heretofore, was taken on the coast of Peru.

HEMICARANX SECHURAE, new species

FIGURE 47

Head 3.9; depth 2.1; D. VIII–I, 30; A. II–I, 25; P. 21.

Body very strongly compressed; dorsal profile in advance of dorsal fins rather evenly and more strongly convex than the ventral, with a rather sharp edge in occipital region; head short, deep, depth at margin of preopercle notably greater than its length; snout quite blunt, 4.15 in head; eye 3.8; interorbital 3.4; mouth oblique, nearly terminal; maxillary extending approximately to anterior margin of pupil, 2.7 in head; teeth in each jaw in a single close-set series; no teeth evident on vomer, palatines, or tongue; gill rakers about three-fourths length of eye, 20 on the lower and 7 on the upper limb of first arch; lateral line with a short, high arch, becoming straight over base of first anal spine, the chord of arch 2.75 in straight part, and 4.5 in length; scutes present throughout the straight part of lateral line, mostly strong and deep, each provided with a spine, 45 more or less developed; scales present on chest, but wanting on the head and median portion of back in advance of dorsal fins; first dorsal composed of short, strong spines, the fourth the longest, a little shorter than eye, the origin of fin a little behind base of pectoral; second dorsal and anal similar, highest anteriorly, though without lobes, the longest rays in dorsal about as long as postorbital part of head, decreasing very gradually in length posterior to about the sixth one, none of the rays in the posterior fifth of the fin exceeding length of eye; caudal rather deeply forked, the upper lobe more pointed than the lower, also a little the longer, somewhat longer than head; origin of anal about an eye's diameter posterior to that of second dorsal, these fins coterminal; ventral small, inserted under base of pectoral, 2.1 in head; pectoral a little longer than head, somewhat falcate, reaching a little beyond origin of anal, 3.6 in length.

Color brownish gray above; this color merging into the silvery gray of lower parts; no trace of bars or bands; a dark blotch on upper part of opercle; ventral fins a dirty white; other fins all more or less dusky; second dorsal and anal quite dark, the latter with an indefinite white margin, most pronounced anteriorly; pectoral darkest at base, black on inner side.

A single specimen, 135 mm. (105 mm. to base of caudal) long, was dredged by the Mission in Sechura Bay, near Sechura. This specimen (U.S.N.M. No. 127920) apparently represents a new species, though it is closely related to *H. leucurus* (Günther), which as far as known inhabits only Panama Bay. The Peruvian fish, although about 40 mm. longer than any at hand from Panama, differs in so many characters, some of which apparently cannot be ascribed to age, that it must be regarded as distinct. The dorsal profile is higher and more evenly convex than in Panama specimens. The arched part of the lateral line is considerably shorter, being notably less than half the length of the straight part in the Peruvian fish, whereas it is fully half the length of the straight part in Panama fish. The second dorsal and anal are quite differently shaped; as in the Peruvian example the rays in both fins decrease gradually in length after about the sixth ray, none of the rays in the posterior fifth or so of the fins being longer than the eye, and the margins of the fins are nearly straight, whereas in the Panama fish the rays decrease little in length to near the end of the fin, those at about the beginning of the last fifth of the second dorsal being about twice the length of the eye, and the margins of both fins are strongly convex. Furthermore, in the Peruvian fish the caudal is much more deeply forked, and the lobes are notably longer; the pectoral is much longer; and the bony scutes in the lateral line are much more prominent. These last-mentioned differences may in large part result from the greater age and size attained by the Peruvian fish. The largest Panama fish at hand, and the ones described as *Caranx furthii* (considered a synonym of *H. leucurus*) by Steindachner (1875b,

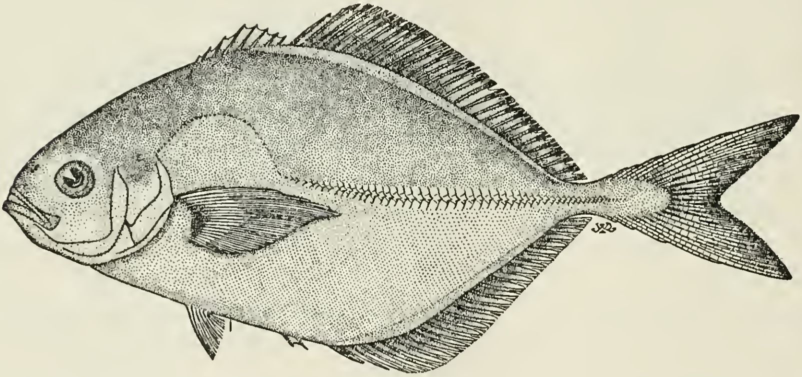

FIGURE 47.—*Hemicaranx sechurae*, new species. From the type, 135 mm. long, Sechura Bay, Peru (U.S.N.M. No. 127920).

p. 12), ranging up to 125 mm. in length, all had black bands, though the bands tended to become less well defined in the larger ones. The Peruvian fish shows no signs of bands whatsoever.

Range.—Known only from the type from Sechura Bay, Peru.

Genus TRACHINOTUS Lacepède, 1802

PÁMPANOS

Body usually rather short, compressed, sometimes ovate; head short; snout very blunt; mouth only lightly oblique, nearly or quite terminal; premaxillaries protractile; maxillary without a distinct supplemental bone, generally reaching about middle of eye; teeth villiform, in bands in jaws, present also on vomer and palatines, and sometimes on tongue, disappearing with age in some species; lateral line scarcely arched, entirely unarmed, without a keel; scales very small; first dorsal composed of six spines, separate in adult, more or less connected by membrane in young; second dorsal and anal similar, longer than abdomen, usually more or less elevated anteriorly, sometimes greatly produced; caudal fin broadly forked, the lobes sometimes produced in adult; pectoral never falcate, usually shorter than head.

Two species are included in the collections from Peru.

KEY TO THE SPECIES

a. Second dorsal with 19 to 21 rays; anal with 18 to 20 rays; gill rakers 16 or 17 on lower limb of first arch; anterior lobes of second dorsal and anal greatly produced in adult, reaching beyond base of caudal; side with about 5 black bars in adult -- **rhodopus** (p. 213)

aa. Second dorsal with 24 to 27 rays; anal with 22 to 25 rays; gill rakers 8 to 10 on lower limb of first arch; anterior lobes of second dorsal and anal never greatly produced, rarely if ever reaching beyond middle of base of fins; side without bars -- **paitensis** (p. 215)

TRACHINOTUS RHODOPUS Gill

PÁMPANO FINO

Trachynotus rhodopus GILL, 1863a, p. 85, Cape San Lucas, Baja California (original description, based on specimens 1 to 2 inches long).

Trachinotus rhodopus JORDAN and EVERMANN, 1896, p. 941 (description; synonymy).—MEEK and HILDEBRAND, 1925, p. 383, pl. 37, Panama Bay (synonymy; description; compared with *T. glaucus* from the Atlantic; range).

Head 3.3, 3.2, 3.8; depth 2.3, 2.2, 1.85; D. VI–I, 21, 19, 21; A. II–I, 20, 19, 18; P. 18, 17, 19.

Body rather deep, strongly compressed; back high; dorsal profile quite convex, the margin trenchant in adult; head moderately long; snout blunt, 3.85, 4.2, 3.9 in head; eye 4.0, 4.2, 4.6; interorbital 3.3, 3.1, 2.5; mouth fairly large, slightly oblique, terminal; maxillary reaching to or somewhat beyond middle of eye 2.3, 2.4, 2.55 in head;

teeth in the jaws small, not specially reduced in adult, in a band in each jaw, becoming very narrow posteriorly; gill rakers moderately slender, exceeding half the eye in length, 16, 16, 17 on lower and 8, 8, 8 on upper limb of first arch; lateral line scarcely arched, somewhat wavy anteriorly; scales minute, somewhat embedded, especially in young; dorsal spines short, especially in adult, the posterior ones somewhat connected by membranes in young; second dorsal and anal similar, each with a large lobe anteriorly, the lobe of dorsal in the smaller specimens a little shorter than head and failing to reach end of dorsal base, the lobes greatly produced in adults, reaching far beyond base of caudal; caudal not especially deeply forked in small specimens, the lobes of about equal length, only about as long as head, more pointed and much produced in adult, about twice length of head; anal spines somewhat connected by membranes in small specimens, separate in adult, base of anal, exclusive of the 2 free spines, 3.0, 2.9, 2.6 in length; ventral well developed, inserted shortly behind pectoral, reaching vent in small specimens, notably shorter in adult; pectoral rather small, pointed, notably shorter than head, 4.8, 4.6, 5.1 in length.

Color bluish gray along back, this color merging into the silvery or yellow color of lower parts. The largest specimen yellowish below, the smaller ones silvery gray. The large specimen with five black cross bars; these missing in the small specimens (the bars faintly discernible in a specimen 105 mm. long from Panama Bay). Ventral fins largely white; other fins more or less dusky; the lobes of second dorsal and anal darker than rest of fins.

The Mission preserved three specimens, respectively 87, 95, and 260 mm. (63, 67, and 178 mm. to base of caudal) long. One of the small ones was seined and the other dredged in Lobos de Tierra Bay, and the large one was caught in a trammel net in Chilca Bay. These specimens form the basis for the description. The proportions and enumerations are given separately for each specimen in order of their size, beginning with the smallest one. It is evident from the description that the fish undergoes rather great changes with age and growth. This species probably is not numerous enough to be of commercial importance in Peru.

Range.—Gulf of California (Mazatlán and Cape San Lucas) to Peru. Previously apparently recorded only from as far south as Tumaco, Colombia. I have examined, also, a specimen (U.S.N.M. No. 102290) taken by W. L. Schmitt at Chatham Island, Galápagos Archipelago.

TRACHINOTUS PAITENSIS Cuvier and Valenciennes

PÁMPANO

FIGURE 48

Trachinotus paitensis CUVIER and VALENCIENNES, 1831, p. 438, Paita, Peru (original description, based on a 2½-inch specimen; D. VI–I, 28; A. I, 26. Number of soft rays given somewhat greater than in any specimen now at hand).—REGAN, 1913, p. 278, Lobos de Tierra (description, based on a specimen 85 mm. long; D. VI–I, 28; A. I, 24).

Trachinotus paloma JORDAN and STARKS, *in* Jordan, 1895, p. 437, Mazatlán, Mexico (original description; D. VI–I, 24; A. II–I, 23).—STARKS, 1906, p. 786, Callao, Peru (this species compared with *T. carolinus* of the Atlantic).—EVERMANN and RADCLIFFE, 1917, p. 62, pl. 6, fig. 1 (description based on a large specimen, 380 mm. long; D. VII–I, 25; A. II–I, 23).—NICHOLS and MURPHY, 1922, p. 508, Lobos de Tierra Island, Peru.—MEEK and HILDEBRAND, 1925, p. 386, Panama Bay (references; description; compared with specimens from Cape San Lucas, and with specimens of *T. carolinus* from the Atlantic).

Head 3.5 to 4.25; depth 2.2 to 2.5; D. VI–I, 24 to 27 (first dorsal rarely with 7 spines); A. II–I, 22 to 25; P. 17 or 18.

Body moderately deep, strongly compressed; back rather high; dorsal profile anteriorly convex, its margin trenchant; head short; snout very blunt, 3.8 to 4.3 in head; eye 3.7 to 5.6; interorbital 2.5 to 3.3; mouth rather small, nearly horizontal, terminal; maxillary reaching nearly or quite opposite middle of eye 2.6 to 3.1 in head; teeth in the jaws in bands, much more prominent in small specimens than in large ones; gill rakers about as long as pupil, 8 to 10 on lower and 3 or 4 very short ones on upper limb of first arch; lateral line scarcely arched, slightly wavy anteriorly; scales minute, elongate, some with free edges in large specimens; dorsal spines short, strong, connected by membranes only in small specimens, under about 110 mm. in length; second dorsal and anal similar, both somewhat elevated anteriorly, the lobe of dorsal about as long as head without snout in large specimens, not quite reaching middle of base of fin, shorter in small ones; anal preceded by two free spines, these somewhat connected with each other and with rest of fin in small specimens; base of anal, exclusive of free spines, 2.5 to 3.1 in length; ventral well developed, inserted very shortly behind base of pectoral, generally reaching rather more than halfway to origin of anal; pectoral fairly small, pointed, reaching about opposite vent, a little shorter than head, not increasing in proportionate length with age and growth, 4.2 to 5.4 in length.

Color lead gray to bluish above; this color merging into the pale silvery of the lower parts along middle of side; dorsal and caudal generally more or less dusky, the anterior lobe of dorsal black; anal colorless except for dusky points, the anterior lobe often white; ventrals generally white; pectorals mostly colorless on outer side, largely dusky on inner side.

The Mission furnished nine specimens, 75 to 270 mm. (57 to 197 mm. to base of caudal) long, collected at Puerto Pizarro, Sechura Bay, and Chilca Bay. There is also at hand a large specimen, 285 mm. long to base of caudal (U.S.N.M. No. 77686), taken at Lobos de Tierra by R. E. Coker, and four very small specimens, 22 to 24 mm. long to base of caudal (U.S.N.M. No. 107148), taken at Paita by W. L. Schmitt. The proportions of the juveniles from Paita are not included in the description.

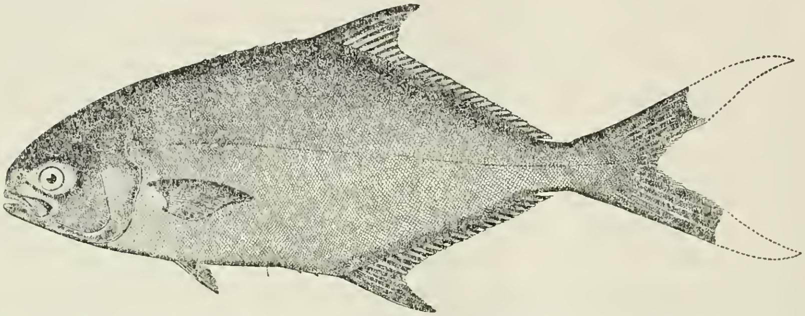

Figure 48.—*Trachinotus paitensis* Cuvier and Valenciennes. From a specimen 285 mm. long to base of caudal, Lobos de Tierra Island, Peru (U.S.N.M. No. 77686). (After *T. paloma* Evermann and Radcliffe, 1917.)

It is stated in the report of the Mission (1943, p. 289) that this pámpano is one of Peru's best food fishes; that it enters the commercial catches in fair quantities, catches being reported from as far south as Chala; and that it usually was found on fairly rough sand beaches and was caught in seines, gill nets, and trammel nets, apparatus also used by commercial fishermen. The average size of the individuals taken by the Mission was about 200 mm. The large specimen secured by R. E. Coker, which was reported to be 380 mm. long (caudal now broken), may be near the maximum size attained.

Range.—Baja California to Peru. Also reported from Valparaiso, Chile, as *T. paloma* without comment, by Fowler (1940b, p. 768).

Genus CHLOROSCOMBRUS Girard, 1859

Body fairly deep, strongly compressed; ventral outline more strongly convex than the dorsal, each with a trenchant edge anteriorly; mouth nearly vertical; lower jaw in advance of upper; premaxillaries protractile; maxillary broad, with a large supplemental bone; teeth small, present on jaws, vomer, palatines, and tongue; gill rakers fairly numerous, slender; lateral lines with a strong arch anteriorly, with or without bony scutes posteriorly; first dorsal with weak spines, mostly connected by membranes; second dorsal and anal similar, long and low, longer than chest and abdomen; caudal deeply forked; ventral rather small; pectoral long, falcate.

A single species comes within the scope of the present work.

CHLOROSCOMBRUS ORQUETA Jordan and Gilbert

Chloroscombrus orqueta Jordan and Gilbert, 1883c, p. 646, Panama Bay (original description, compared with *C. chrysurus*).—Meek and Hildebrand, 1925, p. 370, pl. 30, fig. 2, Panama Bay (references; descriptions; compared with *C. chrysurus* of the Atlantic; range).—Tortonese, 1939b, p. 338, Callao, Peru.

Head 3.9 to 4.0; depth 2.55 to 2.7; D. VIII–I, 27 or 28; A. II–I, 26 or 27; P. 19; scales about 145, too small to enumerate accurately.

Body very strongly compressed; ventral outline notably more strongly curved than the dorsal, each trenchant anteriorly; head short, its depth at middle of eyes a little less than its length from tip of upper jaw; snout short, 3.5 to 3.9; eye 3.2 to 3.75; interorbital 4.3 to 5.0; mouth not quite vertical; tip of lower jaw entering dorsal profile; premaxillary not curved; maxillary broad, its width exceeding half diameter of eye, emarginate posteriorly, 2.7 to 3.0 in head; teeth in jaws very small, in a band in each jaw; gill rakers slender, about three-fourths length of eye, 35 to 37 on lower and 8 to 10 on upper limb of first arch; lateral line with a prominent arch, its chord exceeding length of head, 3.1 to 3.3 in length, straight part with small scutes, forming a slight keel on caudal peduncle; scales small, mostly with free edges, extending forward somewhat on head, wanting on dorsal and ventral ridges; first dorsal with weak spines, connected by membranes, its origin a little behind insertion of pectoral; second dorsal and anal similar, anterior lobes little elevated, scarcely as long as snout and eye, origin of anal (exclusive of free spines) a little behind that of second dorsal, its base 2.15 to 2.2 in length; caudal deeply forked, the lobes pointed, of about equal length, about as long as head; ventrals small, inserted slightly behind pectoral, fitting together in a deep groove, about as long as snout and half the eye; pectoral long, falcate, 2.9 to 3.1 in head.

Color bluish gray above, this color merging into the silvery of the lower parts along middle of side; a black spot on opercle, near its upper angle; a rather indistinct black spot at base of upper lobe of caudal; dorsal, caudal, and pectoral fins with dusky punctulations, other fins pale; axil of pectoral black.

The Mission secured four specimens, 150 to 195 mm. (118 to 156 mm. to base of caudal) long, of this species, previously unreported from Peru. Three of these specimens were seined in Chilca Bay, and one was taken in a gill net in Paita Bay. The specimens differ slightly from examples from Panama Bay, with which they were compared, in having a rather smaller eye, apparently a higher average number of gill rakers, and in being darker in color. However, for the present the specimens from the two localities may be considered as of the same species.

Range.—Gulf of California to Peru.

Genus SERIOLA Cuvier, 1817

AMBERJACKS

Body elongate, moderately compressed; back only moderately elevated; head rather low, not especially blunt; mouth rather large; premaxillaries protractile; maxillary very broad, with a wide supplemental bone; teeth very small, in a band in each jaw, present also on vomer, palatines, and usually on tongue; lateral line with a long low arch, with a slight keel, but no bony scutes, on caudal peduncle; first dorsal with six to eight spines, connected by membranes; second dorsal long, more or less elevated anteriorly; anal similar to second dorsal, but much shorter; ventral generally equal to or slightly longer than the short pectoral.

A single species, *S. colburni,* was secured in Peru by the Mission. A second species, *S. peruana,* was described from Callao. This second species, which probably is identical with *S. mazatlana,* has not been taken by recent collectors. The characters used in the following key are in part based on specimens from Panama Bay and the Galápagos Islands.

KEY TO THE SPECIES

a. Gill rakers few, 15 to 17 on lower limb, and only about 4 on upper limb, of first arch; anterior lobes of second dorsal and anal considerably elevated, longest ray of dorsal 1.3 to 1.5 in head---------------- colburni (p. 218)

aa. Gill rakers more numerous, 20 to 22 on lower limb, and 6 to 8 on upper limb, of first arch; anterior lobes of second dorsal and anal not greatly elevated, longest ray of dorsal 2.4 to 2.6 in head (longer in very young). mazatlana (p. 219)

SERIOLA COLBURNI Evermann and Clark

Seriola colburni EVERMANN and CLARK, 1928, p. 685, pl. 27, off Cape San Lucas, Baja California (original description, based on a skin; compared with related species).—WALFORD, 1937, p. 63, pl. 46, Mexico (diagnosis; size; distribution; habits; angling notes).

Head 3.3; depth 3.15; D. VII–I, 29; A. II–I, 21.

Body fairly compressed, its greatest thickness about half the depth; dorsal profile much more strongly curved than the ventral, with somewhat compressed edge in occipital region; head moderately large, compressed, snout fairly long, 2.6 in head; eye 5.7; interorbital 3.2; mouth a little oblique, terminal; maxillary reaching nearly to anterior margin of pupil, fan-shaped, with a large supplemental bone, slightly rounded, its width exceeding diameter of eye, 2.4 in head; teeth all very small, in a broad band in each jaw; gill rakers rather stout, shorter than eye, 15 on lower and 4 on upper limb of first arch: lateral line with a low arch anteriorly, its chord much shorter than straight part, 3.5 in length, straight part without definite scutes, but with a suggestion of a keel on caudal peduncle; scales small, extending forward on parietal region (embedded), and on cheeks; first dorsal low, fourth spine longest, scarcely longer than eye; second dorsal and anal similar in shape, the latter much the shorter, both elevated anteriorly, the dorsal a little higher, its longest ray 1.3 in head; last ray of each fin somewhat produced; origin of anal under about the thirteenth ray of second dorsal, the fins coterminal, base of anal 3.4 in length; ventral narrow, fully as long as pectoral, inserted immediately behind base of pectoral; pectoral short and broad, 1.8 in head, 6.0 in length.

Color brownish above; this color merging into silvery gray along side; ventral fins dirty white; other fins brownish; pectoral dark brown at base; posterior margin of caudal pale.

The Mission furnished a single large specimen, 1,000 mm. (812 mm. to base of caudal) long. It was taken in the Gulf of Guayaquil, near Cabo Blanco, on a line trawl in about 12 fathoms. This fish apparently is caught commercially with hand lines in the vicinity of Talara and Cabo Blanco, over rocky areas. A large size is attained. Walford (1937, p. 63) reported one from Cape San Lucas, Baja California, weighing 112 pounds. Large individuals examined by me at Pearl Islands, Panama, had fed excusively on fish.

Range.—Cape San Lucas, Baja California, to the Gulf of Guayaquil, in northern Peru, and the Galápagos Islands.

SERIOLA MAZATLANA Steindachner

Seriola mazatlana Steindachner, 1876, p. 8, Mazatlán, Mexico (original description, based on a 150-mm. specimen).—Meek and Hildebrand, 1925, p. 395, Panama Bay (references; description, based on young; range).—Walford, 1937, p. 64, pl. 5, fig. a (diagnosis).

?*Seriola peruana* Steindachner, 1881, p. 13, figs. 1a–1b, Callao, Peru (original description, based on 3 specimens 380 to 390 mm. long).

The following proportions and enumerations are based on specimens 50 to 450 mm. (40 to 345 mm. to base of caudal) long from Panama Bay and the Galápagos Islands, there being no specimens from Peru at hand. Proportions given in Steindachner's description of *S. peruana* that are comparable are given in parentheses.

Head in length 2.8 to 3.5; depth 2.6 to 3.6; pectoral 5.0 to 6.9. Eye in head 3.25 to 4.5 (3.75 to 3.8); snout 3.0 to 3.7 (3.6); interorbital 3.1 to 3.25 (3.25 to 3.4); maxillary 2.5 to 2.7; longest ray of second dorsal 2.4 to 2.6 in specimens 250 to 450 mm. long, 1.6 to 1.95 in specimens 52 to 130 mm. long; ventral 1.3 to 1.65; pectoral 1.55 to 1.75 (about 2.0). D. VII–I, 31 to 34 (VII–I, 32 to 34); A. II, I, 20 to 22 (II–I, 21 or 22); P. 19 to 21 (19); gill rakers 6 to 8+20 to 22.

The very young, under about 100 mm., are banded with black. The larger specimens are uniform grayish brown above; silvery below.

Steindachner (see references above) unfortunately omitted the enumeration of gill rakers, both in *S. mazatlana* and *S. peruana*, perhaps the most important single diagnostic character of the species of the genus. As gill-raker counts are not given, it is uncertain whether the two nominal species are actually identical.

Range.—Mazatlán, Mexico, to the Galápagos Islands, and Peru if *S. peruana* is identical with *S. mazatlana*.

Genus **NEPTOMENUS** Günther, 1860

Body oblong, compressed; head compressed, rather obtuse; mouth wide, nearly terminal; premaxillaries not protractile; teeth in a single series in each jaw, none on vomer, palatines, or tongue; lateral line without definite bony scutes (at least in the American species); first dorsal composed of seven or eight short spines connected by membranes; second dorsal and anal similar in shape, somewhat elevated anteriorly, the anal much shorter; no finlets; ventral attached to abdomen by membrane; pectoral much longer, pointed.

A species apparently belonging to the genus *Neptomenus*, which has a representative in New Zealand, occurs in Peru.

NEPTOMENUS CRASSUS Starks

Cojinoba

Figure 49

Neptomenus crassus Starks, 1906, p. 784, fig. 8, Callao, Peru (original description).—Evermann and Radcliffe, 1917, p. 57, Callao and Mollendo, Peru (description).—Nichols and Murphy, 1922, p. 507, Central Chincha Island, and Pescadores Islands, off Ancon, Peru (notes on the great abundance, schooling, and methods of catching).

Seriolella crassus Fowler, 1940b, p. 768, fig. 47, Callao, Peru (identified from a painting and a sketch; very probably not *Seriolella*, which is described as having vomerine teeth and a denticulate preopercle).

Head 2.75, 2.8; depth 2.85, 2.95; D. VII–I, 27, VIII–I, 26; A. III, 19, III, 17; P. 22, 21.

Body rather deep, compressed; dorsal and ventral profiles anteriorly about evenly convex; caudal peduncle compressed, its depth 5.1, 5.35 in head; head large, deep; snout fairly blunt, 4.1, 3.9 in head; eye large, 4.1, 3.9; interorbital 3.9, 3.65; mouth oblique; lower jaw projecting slightly; maxillary rather narrow, with a supplemental bone, reaching anterior margin of pupil, 3.2, 3.1 in head; teeth in each jaw small, even, in a single close-set series, none on vomer, palatines, or tongue; gill rakers compressed, about as long as pupil, 17, 16 on lower limb, and 6, 6 on upper limb, of first arch; lateral line apparently nearly straight (its course difficult to see because scales are mostly lost in specimens at hand), without scutes; spines of first dorsal short and rather weak, the third or fourth longest, shorter than eye, origin of fin over base of pectoral; second dorsal elevated anteriorly, the longest rays about as long as postorbital part of head, the last ray somewhat longer than the preceding ones; caudal fairly deeply forked, the lobes nearly as long as head; anal preceded by one more or less disconnected spine, the third ray (indicated as soft in current description) about half as long as the fourth, quite spinelike, fin similar in shape to second dorsal, though shorter, and coterminal with it; ventral pointed, 2.05, 2.1 in head; pectoral long, pointed, 3.1, 3.15 in length.

"Color in alcohol: Brownish, dusky on back and light on belly; top of head black; fins dusky, axil of pectoral dark. Small individuals are silvery in coloration." (Evermann and Radcliffe.)

The Mission did not furnish specimens of this species, which, according to Nichols and Murphy (see reference above), at times at least seems to be abundant. This species is mentioned by the Mission in the statistical account (1943, p. 273), wherein it is shown as entering the market in fair quantities, the principal catches being reported from Talara, Huarmey, Callao, Pisco, Mollendo, and Ilo. The foregoing description, exclusive of color, is based on two specimens (U.S.N.M. Nos. 77513, 77593), 165 and 185 mm. (123 and 142 mm. to base of caudal) long, taken at Mollendo by R. E. Coker. The proportions and enumerations based on the smaller specimen, in each instance, are given first.

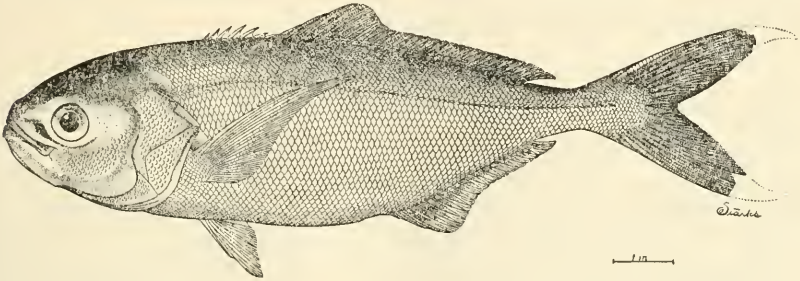

FIGURE 49.—*Neptomenus crassus* Starks. From the type, 340 mm. long, Callao, Peru (U.S.N.M. No. 53465). (After Starks, 1906.)

Range.—Coast of central and southern Peru.

Genus OLIGOPLITES Gill, 1863

Body elongate, rather strongly compressed; dorsal margin anteriorly compressed, forming a sharp edge; mouth rather large, oblique; lower jaw strongly projecting; premaxillaries not protractile; maxillary long, very narrow; teeth on vomer, palatines, and tongue; scales linear, embedded, placed at various angles to each other.

OLIGOPLITES MUNDUS Jordan and Starks

Oligoplites mundus Jordan and Starks, *in* Jordan and Evermann, 1896, p. 344, Mazatlán, Mexico (name only); 1898, p. 2844 (original description).—Meek and Hildebrand, 1925, p. 389, pl. 28, fig. 2, Panama Bay (synonymy; description; range).—Tortonese, 1939b, p. 338, Callao, Peru (notes).

This species is not included in the collections studied. It is introduced here solely on the record by Tortonese cited above, who listed a single specimen from Callao.

The elongate, strongly compressed body, covered with linear scales, placed at various angles to each other, distinguishes the species of this genus. *O. mundus* differs from the other species in having a very large mouth, with a maxillary that reaches far beyond the eye, in having only seven to nine gill rakers on the lower limb of the first arch, and in having numerous pores on the head leading to canals that ramify under the skin.

Range.—Baja California to Callao, Peru.

Genus VOMER Cuvier, 1817

Body ovate, very strongly compressed; head short and deep, its anterior profile nearly vertical, more or less concave; snout projecting only slightly; mouth moderate, oblique; maxillary broad, with a supplemental bone; teeth minute, present on jaws, vomer, tongue, and usually on palatines; lateral line anteriorly with a high arch, its chord shorter than rest of line, straight part with small bony scutes; scales rudimentary, except on caudal peduncle; second dorsal and anal low, without high lobes anteriorly. Anterior spines of first dorsal bearing filaments, and the ventral enlarged, in very young.

A single species comes within the scope of the present work.

VOMER DECLIVIFRONS Meek and Hildebrand

Reloj

Argyreiosus setipinnis Günther (in part not of Mitchill), 1860, p. 459, variety A, from Peru (description; specimens listed).

Vomer setipinnis Starks (not of Mitchill), 1906, p. 786, Callao, Peru.—Regan (not of Mitchill), 1913, p. 278, Ferrol Bay, Peru.—Fowler (in part not of Mitchill), 1940b, p. 768, Brazil and Peru.

Vomer gabonensis Abbott (not of Guichenot), 1899, p. 347 (Guichenot's name for an African *Vomer* attached to Günther's variety A; see references above).

Vomer declivifrons Meek and Hildebrand, 1925, p. 367, pl. 29, fig. 2, Panama Bay (synonymy; description; compared with *V. setipinnis* of the Atlantic; range).—Walford, 1937, p. 79, pl. 55, fig. a, in color (distinguishing characters; size attained).

Head 2.65 to 3.1; depth 1.33 to 1.8; D. VIII–I, 22 or 23; A. II–I, 17 to 19; P. 17 to 19.

Body everywhere with sharp edges; anterior profile steep, concave in front of eyes, forming an angle of about 130° in occipital region; back in front of dorsal fin, straight, nearly horizontal, with three slight humps in advance of dorsal; ventral margin from vent to origin of anal formed of a continuous bony plate, with two points (anal "spines") in young, these scarcely evident in larger specimens; snout (measured from eye to tip of upper jaw) 2.0 to 2.4 in head; eye 3.7 to 4.5; interorbital 6.0 to 6.6; horizontal distance from eye to margin of profile less than diameter of eye, and greater than half the space between eye and premaxillary; mouth very oblique; mandible extending in front of gape; maxillary rather wider than half diameter of eye, 2.65 to 2.8 in head; teeth in jaws minute, in a single series or in a narrow band; gill raker slender, scarcely denticulate on inner edge, about two-thirds length of eye, 29 to 32 on lower and 7 to 9 on upper limb of first arch; lateral line anteriorly with a high arch, chord of arch shorter than straight part by length of caudal peduncle; scales small, rudimentary, somewhat enlarged and with free margins on caudal peduncle; first dorsal with the anterior three or four spines connected by membranes, the longest about half diameter of eye, slightly produced and about as long as eye in the smallest specimen in the collection, the other spines separate and very short; second dorsal with a slightly produced lobe in front, equal to length of snout in the largest specimen in the collection, proportionately shorter in the others; anal similar to second dorsal, though without an evident lobe in front, its origin under or a little behind or slightly in front of that of second dorsal, its base 1.85 to 2.0 in length; ventral very small, shorter than eye (somewhat enlarged in very small specimens); pectoral falcate, proportionally longer in large specimens than in small ones, 2.6 to 3.1 in length.

Color bluish along back; the rest of body silvery; smallest specimen in the collection with a dark blotch at beginning of straight part of lateral line; dorsal fins more or less dusky; other fins pale to straw yellow; axil of pectoral dusky.

The Mission preserved 17 specimens, 50 to 145 mm. (37 to 112 mm. to base of caudal) long, taken in the Gulf of Guayaquil, off Puerto Pizarro, in Paita Bay, Sechura Bay, and in Chilca Bay, which form the basis for the description. This material seems to agree in all respects with specimens from Panama Bay, with which it was compared. This species differs from the common Atlantic form (*V. setipinnis*) in having one to four more gill rakers on lower limb of the first arch, and the body is rather less angulate anteriorly and not quite so deep. The difference in depth is evident only in measurements based on specimens of equal size, as in both species the depth in proportion to the length decreases with growth.

Range.—Baja California to Peru.

Genus SELENE Lacepède, 1803

Body ovate, very strongly compressed; head short and deep, its anterior profile very steep, but not vertical, scarcely if at all concave; snout projecting moderately; mouth moderate, oblique; maxillary broad, with a supplemental bone; teeth minute, present on jaws, vomer, tongue, and sometimes on palatines; lateral line with a high arch anteriorly, its chord equal to or longer than straight part of line, straight part without definite scutes; scales rudimentary, except on caudal peduncle; second dorsal and anal with prominently produced lobes anteriorly in large specimens. Anterior dorsal spines bearing filaments, and the ventral fins greatly enlarged in young.

Only one species is known from Peru.

SELENE BREVOORTII (Gill)

RELOJ; CORCOVADO

Argyriosus brevoortii GILL, 1863a, p. 83, Baja California (original description, based on a young individual).—WALFORD, 1937, p. 80, pl. 55, fig. b, in color (diagnostic characters; habits; size attained).

Selene vomer EVERMANN and RADCLIFFE (not of Linnaeus), 1917, p. 62, Tumbes River, Peru (enumerations and proportions based on a small specimen).

Selene brevoortii MEEK and HILDEBRAND, 1925, p. 374, pl. 32, Panama Bay (synonymy; description; compared with *S. vomer* of the Atlantic).

Head 2.5 to 2.6; depth (at vertical from origin of anal) 1.4 to 1.6; D. VIII–I, 21 or 22; A. II, I, 17 or 18; P. 18 or 19.

Body everywhere with sharp edges; anterior profile oblique, a little concave over snout, forming an angle in occipital region of about 120°; back, in front of dorsal fin, with three low humps; ventral margin from vent to anal formed of a continuous bony plate, with two sharp points (anal "spines") in young, these scarcely evident in adults; snout 1.6 to 1.8 in head; eye 4.4 to 6.0; interorbital 6.4 to 7.0; horizontal distance from eye to margin of profile equal to or less than diameter of eye, and less than half width of space between eye and premaxillary; mouth quite oblique; mandible projecting; maxillary wider than half diameter of eye in large examples, 3.0 to 3.4 in head; teeth in jaws minute, in a more or less definite band in each jaw, gill rakers slender, denticulate along inner edge, about two-thirds length of eye, 29 to 32 on lower and 5 to 9 on upper limb of first arch; lateral line anteriorly with a high arch, its chord nearly as long as the straight part; scales small, rudimentary, somewhat enlarged and with free edges only on caudal peduncle; first dorsal with two somewhat elevated spines in front, about 1.5 times diameter of eye in adults, these spines bearing long filaments in young, the other spines low and separate; second dorsal greatly elevated anteriorly in large specimens, the elevated portions in some specimens reaching base of caudal, in others nearly to tip of caudal fin; anal, except for the less produced anterior lobe, similar to second dorsal, its base 2.1 to 2.3 in length; ventral scarcely longer than eye in large examples, very large in young, about as long as head in smallest specimen at hand; pectoral falcate, proportionately longer in large examples than in small ones, 2.3 to 2.6 in length.

Color bluish to dusky along back, the rest of body bright silvery; anterior margin and produced portion of second dorsal dark; fins otherwise mostly pale to straw yellow.

The Mission supplied four specimens, respectively 115, 250, 260, and 280 mm. (84, 194, 200, and 208 mm. to base of caudal) long, which were taken at Lobos de Tierra Island, and in Sechura Bay. Another specimen, about 65 mm. (54 mm. to base of caudal) long, was taken in the mouth of the Tumbes River by R. E. Coker. These form the basis for the foregoing description. They seem to agree in all respects with specimens from Panama with which they were compared. The additional data here supplied confirm the stability of the specific distinctions between the Atlantic and Pacific representatives of the genus, as pointed out by Meek and Hildebrand (1925, p. 375). *S. brevoortii* consistently has two to six more gill rakers on the lower limb of the first arch than *S. vomer*, and when specimens of equal size are measured it becomes evident that *S. brevoortii* is scarcely as deep as *S. vomer*.

Range.—Baja California to Northern Peru.

Family NEMATISTIIDAE: Papagallos

Body compressed, deep anteriorly; head moderately short, blunt, compressed; mouth large, oblique; maxillary reaching far beyond anterior margin of eye, with a supplemental bone; teeth very small, in bands on jaws, also present on vomer, and sometimes on palatines; gills four; lateral line with a long, low curve, without a keel or scutes; scales quite small; dorsal fins two, each with a high membranous sheath; spines of first dorsal, exclusive of the first one, produced into long filaments (except in young); second dorsal and anal each somewhat elevated anteriorly, the last ray of each enlarged, the anal much shorter than second dorsal; caudal forked; ventral rather large, inserted under base of pectoral; pectoral very long and falcate in large examples.

A single genus, with one species, is known.

Genus NEMATISTIUS Gill, 1862

The characters of the genus are included in the family description.

NEMATISTIUS PECTORALIS Gill

Peje-chino

Nematistius pectoralis Gill, 1862, p. 259, Cape San Lucas, Baja California (original description).—Jordan and Evermann, 1896, p. 895, fig. 377 (description; synonymy).—Meek and Hildebrand, 1923, p. 330, Panama Bay (synonymy; description; range).—Walford, 1937, p. 55, pl. 44 in color (diagnosis; distribution; angling notes).

Head 3.6; depth 3.4; D. VIII–I, 25; A. II, 15; P. 16; scales about 130 (too small and irregular to numerate accurately).

Body compressed, deepest over base of pectorals, tapering posteriorly to the rather slender caudal peduncle; dorsal profile anteriorly rather strongly convex, with a compressed edge in occipital region; head moderately large, compressed; snout fairly blunt, 3.4 in head; eye 5.8; interorbital 2.9; mouth large, somewhat oblique, terminal; maxillary reaching opposite posterior margin of eye, with a large supplemental bone, rounded posteriorly, its width equal to vertical diameter of eye, 2.0 in head; teeth all minute, in a broad band in each jaw, a small patch on vomer; gill rakers broad, compressed, finely denticulate on inner edge, about three-fourths length of eye, 10 on lower and 2 on upper limb of first arch; lateral line with a very long low curve, becoming median in position over about middle of anal, without keel or scutes; scales small, extending forward on head in parietal region, on upper part of opercle, and covering most of preopercle and cheek; high membranous sheaths of dorsal and anal fins covering the fins if laid down; origin of first dorsal a little in advance of base of pectoral, its filaments reaching far beyond middle of second dorsal; second dorsal and anal similar in shape, the latter much the shorter, both somewhat elevated anteriorly, the longest ray of dorsal about equal to snout and eye, the last ray of each enlarged, the fins approximately coterminal; origin of anal under or near middle of base of second dorsal, its base 4.9 in length; ventral with a short inner lobe, 1.5 in head; pectoral very long, falcate, reaching a little beyond vertical from vent, 2.9 in length.

Color bluish gray with metallic reflections along back, changing rather abruptly to the silvery gray of the lower parts along middle of side; these colors separated by an indefinite dark streak somewhat above middle of side posterior to origin of second dorsal, this streak bent upward under first dorsal, oblique portion very indistinct; a second obscure broad oblique streak under anterior dorsal spines; filaments of first dorsal black; second dorsal, caudal, and anal dusky; ventral and pectoral largely colorless, the latter black at base of lower half, inside of base also black. (Young, according to Panama specimens, with more dark bars and spots.)

The Mission furnished a single specimen, 925 mm. (712 mm. to base of caudal) long, which was taken in the Gulf of Guayaquil off Zorritos, while trolling. A weight of 78 pounds of an individual taken in Panama Bay has been reported.

Range.—Gulf of California to northern Peru. Previously apparently not recorded from south of Panama.

Family CORYPHAENIDAE: Dolphinfishes

Body elongate, compressed; mouth wide, oblique; lower jaw projecting; teeth small, present on jaws, vomer, palatines, and tongue; gills 4, the membranes free from the isthmus; branchiostegals 7; lateral line developed; scales very small; dorsal fin very long, with many rays, beginning over nape; caudal deeply forked; anal similar to dorsal, but shorter; ventrals well developed, attached to thorax, with I, 5 rays; pectorals small.

Genus CORYPHAENA Linnaeus, 1758

The characters of the genus are those of the family.

A single species was obtained in Peru.

CORYPHAENA HIPPURUS Linnaeus

DORADO

Coryphaena hippurus LINNAEUS, 1758, p. 261, "Habitat in Pelago" (diagnosis).—JORDAN and EVERMANN, 1896, p. 952, fig. 402 (description; size attained; range; synonymy).—MEEK and HILDEBRAND, 1925, p. 406, Panama Bay (synonymy; description, based on young).—WALFORD, 1937, p. 53, pls. 4 and 43, the latter in color (key to the species; diagnosis; distribution; life history; angling notes).

Head 4.4; depth 4.3; D. 60; A. 25; P. 18.

Body rather strongly compressed, its greatest thickness equal to two-fifths its depth, greatest depth occurring at vertical from base of pectoral, tapering gradually into a moderately slender, compressed caudal peduncle, contained 4.0 times in head; anterior profile moderately elevated (in female); head short, with nearly vertical opercular margins; snout blunt, 2.8 in head; eye 4.9; interorbital 2.6; mouth rather large, nearly terminal; maxillary reaching nearly opposite middle of eye, 2.0 in head; teeth in jaws in bands, the outer ones somewhat enlarged, villiform teeth present also on vomer, palatines, and tongue; gill rakers rather poorly developed, nine on lower and only a few tubercles on upper limb of first arch; lateral line with a short high arch anteriorly, unarmed; scales very small, missing on most of head, mostly more or less embedded; dorsal long, continuous, its origin about over posterior margin of eye; caudal deeply forked, the lobes slender, of nearly equal length, exceeding length of head by about diameter of eye; anal with a short lobe anteriorly, coterminal with the dorsal; ventral long, slender, inserted below lower part of base of pectoral, extending far beyond tip of pectoral, 1.1 in head, 5.4 in length; pectoral pointed, somewhat falcate, 1.4 in head, 6.6 in length.

Color in alcohol dark brown above, becoming lighter on side and merging into the dirty white of lower parts; a row of small black spots on the back, just below base of dorsal; numerous similar spots on side, mostly below lateral line; dorsal and caudal quite dark; anal dusky at base, with a pale margin; upper margin and tip of pectoral dusky, the rest of fin greenish; ventral white on outer side, black on inner side.

A single female, 650 mm. (500 mm. to base of caudal) long, was collected by the Mission off Lobos de Afuera Island and forms the basis for the foregoing description. A few additional individuals seem to have been taken, but not preserved. It is stated in the report of the Mission (1943, p. 247) that this fish (previously apparently not definitely reported from Peru) is "relatively unimportant as a commercial food fish," because it is not obtainable in sufficient quantity. The meat, nevertheless, is said to be "delicious and highly appreciated." It is reported as occurring "offshore in the warm oceanic waters, especially where flying fish are to be found," where it may be taken by trolling, and that it feeds almost entirely on flying fish. It is stated also that "a number of females with large swollen ovaries and almost ripe ova were taken off Callao * * * in February." The female at hand, taken on May 8, has collapsed ovaries.

Range.—On the Pacific coast of America from California (rarely as far north as southern Washington), southward to Peru (at least as far south as Ilo, whence a commercial catch was reported in 1940); also reported from Hawaii, Japan, Oceania, and both sides of the Atlantic.

Family CENTROPOMIDAE: Robalos

Body elongate, moderately compressed; head somewhat depressed above; mouth large; lower jaw projecting; teeth minute, pointed, in bands on jaws, vomer, and palatines; preopercle and supraclavicle serrate; opercle without spines, produced into a flap; gills 4; lateral line decurved anteriorly, extending to end of caudal rays; dorsal fins 2, well separated, the first with 7 or 8 spines, the first spine small or rudimentary, the third and fourth rather long and strong; second dorsal with a well-developed spine, and about 8 to 11 soft rays; caudal forked; anal with 3 spines, and generally with 6 or 7 soft rays; ventrals inserted a short distance behind pectorals, each with a well-developed spine and 5 soft rays.

This family is composed of a single genus, which previously was not reported from Peru.

Genus CENTROPOMUS Lacepède, 1802

The characters of the genus are those of the family.

At least eight species occur on the coasts of tropical America, from Florida and Baja California southward.

CENTROPOMUS NIGRESCENS Günther

Centropomus nigrescens Günther, 1864b, p. 144, Chiapam, Mexico (original description).—Meek and Hildebrand, 1925, p. 426, pl. 42, Panama Bay (synonymy; description; discussion of relationship; range and habitat).

Head 3.0; depth 4.1; D. VIII–I, 9; A. III, 6; P. 15; scales 76.

Body fairly slender, compressed, its greatest thickness a little more than two-thirds its depth; peduncle moderately long and slender, 3.1

in head; head long, rather low, somewhat concave over snout; snout long, moderately broad, 3.6 in head; eye 7.15; interorbital 8.1; mouth large, slightly oblique; lower jaw projecting strongly, pointed, its tip entering dorsal profile; maxillary about two-thirds as wide as eye, reaching below posterior margin of pupil, 2.35 in head; teeth minute, in rather broad bands on jaws, vomer, and palatines; preorbital entire; preopercle serrate, the serrae at its angle somewhat enlarged; preopercular ridge with only one definite spine: supraclavicle sharply serrate; gill rakers at angle of first arch only a little shorter than eye, 9 on lower limb and 4 on the upper one; lateral line decurved anteriorly, reaching middle of side above vent; scales rather small, 8 complete rows between lateral line and middle of second dorsal, forming a narrow sheath at base of dorsals and anal, and extending more or less on caudal, ventral, and pectoral; first dorsal separated from the second a distance fully equal to diameter of eye, its origin a little more than length of snout behind base of pectoral, its distance from tip of snout 2.4 in length, its first spine a mere rudiment, the third longest, 1.9 in head; second dorsal high anteriorly, with concave margin, its spine about half length of longest soft ray; caudal deeply forked, both lobes acute, the upper the longer; anal small, its origin about under middle of second dorsal, the second spine enlarged, a little longer than the third, 2.5 in head; ventral fully halfway to anal, 5.2 in length; pectoral extending opposite beginning of distal third of ventral, 5.3 in length.

Color brownish above; silvery below; lateral line in a dark streak; sides with dusky punctulations; fins brownish to dusky, with few to many dusky points.

This genus and species, previously not reported from Peru, is represented in the collections by one specimen about 400 mm. (313 mm. to base of caudal) long, taken at Paita by W. L. Schmitt. It agrees well with specimens from Panama Bay.

Range.—Baja California to northern Peru. Previously reported from only as far south as Guayaquil, Ecuador. Enters fresh-water streams.

Family LUTIANIDAE: Snappers

Body elongate, compressed; head large, more or less pointed; mouth usually large, terminal or lower jaw projecting; teeth present on jaws, and usually on vomer, palatines, and tongue; premaxillaries protractile; maxillary without a supplemental bone; preopercle serrate or entire; opercle without spines; gill arches 4; gill rakers rather various; gill membranes free from isthmus; pseudobranchiae large; lateral line complete; scales firm, ctenoid; dorsal fin continuous or divided, with 10 to 13 rather strong spines; anal with 3 spines; caudal emarginate to forked; ventral fins thoracic, each with a spine and 5 soft rays; pectorals usually rather long.

KEY TO THE GENERA

a. Anal fin short, with 7 to 9 soft rays; dorsal with 10 or 11 spines; upper jaw with 2 to 4 canines anteriorly; villiform teeth on palatines and tongue. **Lutianus** (p. 230)

aa. Anal fin longer, with 11 to 18 soft rays; dorsal with 12 or 13 spines; no canine teeth in jaws, and no teeth on palatines or tongue.

  b. Anal fin with about 17 or 18 soft rays; dorsal with about 17 or 18 soft rays; margin of preopercle without bony serrae---------- **Xenichthys** (p. 232)

  bb. Anal fin shorter, with about 11 to 13 soft rays; dorsal with 13 to 15 soft rays; margin of preopercle rather strongly serrate---------- **Xenistius** (p. 235)

Genus LUTIANUS Bloch, 1790

Body elongate, compressed; back more or less elevated; head long, generally pointed; nostrils close together, without tubes; mouth large; each jaw with a band of teeth, the outer ones usually enlarged, the upper jaw with 2 to 4 canines anteriorly; villiform teeth on vomer, palatines, and tongue; margin of preopercle serrate; gill rakers rather few; scales moderate, ctenoid, usually extending on base of soft dorsal and anal; dorsal fin continuous, with 10 or 11 spines; caudal fin emarginate or with a shallow fork; anal with 3 rather strong spines and 7 to 9 soft rays.

Two species certainly belong to the Peruvian fauna. Tortonese (1939b, p. 298) recorded *L. steindachneri* (Jordan and Gilbert) from Callao, Peru, and from Rio de Janeiro, Brazil. It is extremely doubtful that the specimens from the two localities are identical. I cannot determine the species from the brief account given by Tortonese.

KEY TO THE SPECIES

a. Rows of scales above lateral line parallel with it, about 47 vertical series above lateral line; teeth on vomer in an anchor-shaped patch, with a long backward extension---------------------------- **argentiventris** (p. 230)

aa. Rows of scales above lateral line not parallel with it, very oblique, about 56 vertical series above lateral line; teeth on vomer in a roughly diamond-shaped patch, with only a slight backward prolongation---- **peru** (p. 231)

LUTIANUS ARGENTIVENTRIS (Peters)

Mesoprion argentiventris Peters, 1869, p. 704, Mazatlán, Mexico (original description).

Lutianus argentiventris Meek and Hildebrand, 1925, p. 513, Panama Bay (synonymy; description; local abundance; range).

Head 2.6, 2.75; depth 2.3, 2.4; D. X, 14, X, 14; A. III, 7, III, 8; P. 16, 16; scales 47, 47.

Body rather compressed, its greatest thickness about half its depth; back elevated; profile in advance of dorsal gently convex; head compressed; caudal peduncle short, quite compressed, 2.9, 2.95 in head; snout long, pointed, 3.3, 3.4 in head; eye 3.2, 3.3; interorbital 5.75, 6.5; mouth large, slightly oblique, terminal; maxillary reaching front of pupil, 2.4, 2.55 in head; teeth mostly small, pointed, a few rather prominent canines on anterior part of upper jaw, and a few slightly enlarged teeth in outer series in lower jaw, those on vomer in an anchor-shaped patch, with a long backward extension, those on palatines and tongue in narrow bands; margin of preopercle serrate, the serrae at angle somewhat enlarged, the margin slightly indented just above angle; gill rakers moderate, those at angle about as long as pupil, 11 more or less developed on lower and 6 on upper limb of first arch; scales strongly ctenoid, rows above lateral line parallel with it, six between it and base of first dorsal spine, those below it horizontal; small scales extending on bases of soft dorsal, anal, and caudal fins; dorsal fin scarcely notched, the fourth spine longest, though scarcely exceeding the fifth and sixth in length, 2.4 in head; caudal moderately concave; anal spines strong, the second stronger but scarcely reaching tip of third if depressed, 2.2, 3.1 in head; ventral inserted directly under base of pectoral, reaching beyond vent, with a rather strong spine contained 2.4, 2.7 in head; pectoral rather broad, reaching scarcely as far back as ventral, 1.35, 1.4 in head, 3.5, 3.8 in length.

Color grayish brown above; silvery gray below; upper part of side with obscure dark crossbars; an obscure dark stripe extending from snout through eye to shoulder; rows of scales obscurely marked with dark streaks; fins mostly plain translucent, the base of dorsal with suggestions of dark spots; base of pectoral with a dark band.

The description is based on two small specimens, 56 and 57 mm. (44 and 44 mm. to base of caudal) long, seined by the Mission in Lobos de Afuera Bay. These specimens were compared with some of about equal length and larger ones from Panama Bay, with which they agree almost perfectly. In large specimens the snout becomes proportionately longer and more pointed, being contained 2.5 to 2.75 in the head. The pectoral fin, too, becomes proportionately longer, being contained 1.15 to 1.2 in head, and 3.2 to 3.4 in length. The larger specimens do not have dark crossbars, nor the dark band through the eye, but have a narrow dark line (blue in life) below the eye.

Range.—Baja California to northern Peru, and the Galápagos Islands. Previously recorded from the coast from only as far south as Guayaquil, Ecuador.

LUTIANUS PERU (Nichols and Murphy)

ESTRELLA

Neomaenis peru NICHOLS and MURPHY, 1922, p. 508, fig. 1, Lobos de Tierra, Peru (original description).

Lutjanus analis TORTONESE (probably not of Rüppell), 1939b, p. 295, Callao, Peru (synonymy; description).

Head 2.6; depth 2.9; D. X, 13; A. III, 8; scales 56.

Body elongate, compressed; back little elevated; caudal peduncle

3.3 in head; snout 3.0; eye 4.5; interorbital 4.0; mouth somewhat oblique; lower jaw projecting slightly; maxillary not quite reaching front of eye, 2.9 in head; teeth in jaws small, upper with small weak canines, none on lower jaw; vomer with a roughly diamond-shaped patch of villiform teeth, somewhat prolonged behind, similar teeth on palatines and tongue; margin of preopercle finely serrate, the serrae at angle somewhat coarser, the margin slightly indented above angle; longest gill rakers half length of eye, 10 on lower limb of first arch; rows of scales below lateral line roughly parallel with it, those above lateral line in very oblique series; dorsal (according to the figure) scarcely indented, longest spine 2.9 in head; caudal lunate, lobes pointed, the upper a little the longer; second anal spine a little shorter but stronger than the third, 4.5 in head; ventral (according to figure) inserted a little behind base of pectoral, 1.8 in head; pectoral (according to the figure) pointed, reaching origin of anal, 1.3 in head.

Color pale brown, darker above; middle rays of caudal narrowly tipped with black; a dusky spot in axil of pectoral. Color in life red. (After Nichols and Murphy.)

Although it is stated in the original account that this snapper "evidently is a food fish of considerable importance, for the Indians from whom the specimen was obtained at Lobos de Tierra had already salted several hundred of the same kind," it was not taken by R. E. Coker or by the Mission. It remains known only from the type, a specimen 280 mm. long to the base of the caudal, which I have not seen.

Range.—Known only from Lobos de Tierra Island, Peru.

Genus XENICHTHYS Gill, 1863

Body elongate, compressed; head more or less compressed, pointed; eyes large; mouth moderate, oblique; lower jaw projecting; teeth minute, in a narrow band on each jaw and on vomer, none on palatines and tongue; margin of preopercle entire; gill rakers slender; scales small, mostly ctenoid; dorsal fins nearly or quite separate, with 12 slender spines and about 17 or 18 soft rays; caudal with a shallow fork; anal with three small graduated spines, the soft part similar to that of dorsal, and with about an equal number of rays.

Jordan (1923, p. 195) erected the family Xenichthyidae to receive this genus and two related ones, *Xenistius* and *Xenocys*. The very oblique mouth, projecting lower jaw, the absence of teeth on the palatines and tongue, the entire preopercular margins, and the many rays in the soft dorsal and anal do set these genera apart, but the writer prefers to classify them with the Lutianidae for the present. Regan (1929) placed these genera among the Pomadasidae.

XENICHTHYS RUPESTRIS, new species

Figure 50

Head 2.8 to 3.1; depth 3.2 to 3.5; D. XI–I, 17 or 18; A. III, 17 or 18; P. 15 or 16; scales 65 to 70; vertebrae 26 (one specimen dissected).

Body quite compressed, its greatest thickness about half its depth; back moderately elevated; profile over snout and eyes nearly straight; ventral outline anteriorly rather strongly convex; head quite compressed; caudal peduncle short, compressed, 3.3 to 3.6 in head; snout pointed, 3.6 to 4.4; eye round, its vertical and longitudinal diameters being equal, 3.0 to 3.3; interorbital convex, 5.2 to 6.0; mouth quite oblique; lower jaw projecting; maxillary reaching a little beyond front of eye, 2.4 to 2.8 in head; teeth minute, in a narrow band on each jaw, and in a V-shaped band on vomer; gill rakers small, those at angle scarcely as long as pupil, 16 to 18 more or less developed on lower and 6 or 7 on upper limb of first arch; scales ctenoid, reduced in size along the back, the reduced scales extending to lateral line anteriorly, but not posteriorly, about 12 or 13 rows between lateral line and base of first dorsal spine, and 10 or 11 between lateral line and base of first soft ray of dorsal, scales extending more or less on all the fins exclusive of the spinous dorsal, the second dorsal and anal being densely scaled; dorsal fins nearly or quite separate, the spines rather weak, the fourth usually longest, generally failing to reach origin of second dorsal if deflexed, 1.75 to 2.1 in head, margin of fin nearly straight; caudal fin (more or less damaged) apparently with a very shallow fork; anal spines small, graduated, the second 5.1 to 6.0 in head, origin of fin about opposite that of dorsal, the soft part similar to that of dorsal; ventral inserted a little behind base of pectoral, failing to reach vent,

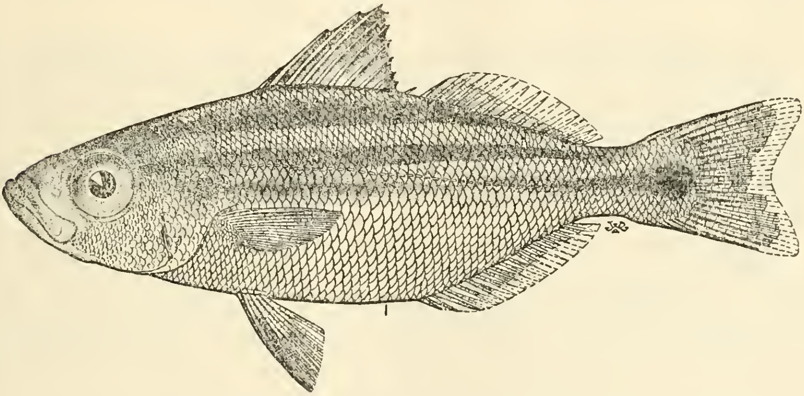

Figure 50.—*Xenichthys rupestris*, new species. From the type, 90 mm. long, Lobos de Afuera Bay, Peru (U.S.N.M. No. 127998).

with a slender spine contained 2.7 to 3.2 in head; pectoral short, scarcely reaching tip of ventral, 1.4 to 1.8 in head, 4.8 to 5.4 in length.

General color grayish above; silvery below; upper part of side with three longitudinal dark brown stripes, fully as wide as pupil, the lowermost one at about middle of side obscure in some specimens; base of caudal with a prominent black spot; fins all more or less dusky, tip of spinous dorsal and ventral quite dark.

Ten specimens with more or less damaged caudal fins, about 75 to 90 mm. (65 to 74 mm. to base of caudal) long, were secured by the Mission in a rocky inlet in Lobos de Afuera Bay. The largest one (U.S.N.M. No. 127998) has been selected as the type. The following proportions and enumerations apply to that specimen: Head in length 3.1; depth 3.2; fourth dorsal spine 5.7; pectoral 4.95. Eye in head 3.1; snout 3.95; interorbital 5.2; maxillary 2.55; caudal peduncle 3.3; fourth dorsal spine 1.8; second anal spine 5.6; ventral spine 2.7; pectoral 1.6. D. XI–I, 18; A. III, 18; P. 16; scales 13–69; gill rakers 6+16.

Two small specimens, each 32 mm. long to base of caudal, from Lobes de Afuera (U.S.N.M. No. 77560), identified and listed as *Isacia conceptionis* by Evermann and Radcliffe, also seem to be of this species. However, the scales are lost, in part, making an accurate count impossible, and the color has faded, leaving only the black caudal spot visible.

This species is close to *X. xanti* Gill (1863a, p. 82), of which no specimens of exactly the same size are available for study. However, in comparing the largest specimen, the type of *X. rupestris*, and the smallest one of *X. xanti* at hand, which is 110 mm. (87 mm. to base of caudal) long, and is from Panama Bay, several differences are evident. The differences are set forth in the following comparisons wherein the proportions are given in percent of the length:

X. rupestris	*X. xanti*
Head deep, rather strongly compressed’ 32.3.	Head lower, broader, and longer, 35.6.
Eye moderately large, round, not vertically elongate, 10.5.	Eye very large, vertically elongate, 12.0.
Interorbital rather broad, transversely convex, 6.2.	Interorbital narrower, flat, 5.75.
Fourth dorsal spine not reaching origin of second dorsal if deflexed, 17.5.	Fourth dorsal spine longer, reaching origin of second dorsal if deflexed, 19.5.
Scales in oblique series enumerated just above lateral line 69 (65 to 70 in 10 specimens).	Scales lost in type (55 to 62 in 14 other specimens).

The color has faded in the smallest specimen of *X. xanti* at hand, though the dark caudal spot remains. The larger specimens of this species, however, have dark stripes along the upper part of the sides, but they are more numerous, there being four or five, and they are notably narrower than in *X. rupestris.*

X. agassizi Steindachner (1875b, p. 6), which seems to be fairly common in the Galápagos Islands, differs in having even smaller scales than *X. rupestris,* though the scales anteriorly above the lateral line are less reduced, and the rows are less strongly oblique (10 or 11–68 to 73 in 8 specimens). The scales, furthermore, are less strongly serrate, being in fact rather definitely cycloid above lateral line in advance of dorsal; and the pectoral is notably longer than in either of the species herein compared, being falcate, and reaching far beyond tips of ventrals, to origin of anal in the larger specimens, 25 to 30 percent of length. The eye is larger than in *X. rupestris,* 10.3 to 12.0 percent of length. No caudal spot and no dark longitudinal lines or bands are evident in the specimens at hand.

Range.—Known only from the type material from Lobos de Afuera Bay, Peru.

Genus XENISTIUS Jordan and Gilbert, 1883

Body rather elongate, moderately compressed; head fairly low, pointed; eye moderately large; mouth oblique; lower jaw projecting; teeth minute, in a narrow band on each jaw and on vomer; margin of preopercle rather strongly serrate; scales moderate or rather small, ctenoid; dorsal fin nearly or quite continuous, with 12 or 13 rather slender spines, and 13 to 15 soft rays, the soft portion notably longer than the spinous part; anal with 3 spines and 11 to 13 soft rays.

A single species is included in the Peruvian collections studied. The genus apparently has not been reported from any locality intermediate of the Gulf of California and northern Peru.

XENISTIUS PERUANUS, new species

FIGURE 51

Xenistius californiensis NICHOLS and MURPHY (not of Steindachner), 1922, p. 509, Lobos de Tierra Island, and North Chincha Island, Peru ("several hundred young" reported).

Head 2.8 to 2.9; depth 3.4 to 3.8; D. XIII, 13 to 15; A. III, 11 to 13; P. 17 or 18; scales 70 to 80.

Body fairly compressed, its greatest thickness about half its depth; back moderately elevated; profile nearly straight from nostrils to nape; ventral outline anteriorly more strongly rounded than dorsal outline; head large, compressed; caudal peduncle slender, 4.0 to 4.4 in head; snout moderately pointed, 4.0 to 4.7; eye 3.1 to 3.7; interorbital 5.3 to 6.2; mouth oblique; lower jaw projecting; maxillary reaching somewhat beyond front of eye, 3.2 to 3.5 in head; teeth minute, a narrow band in each jaw, and in a V-shaped band on vomer; gill rakers slender, those at angle fully half length of eye, 21 or 22 on lower and 9 to 11 on upper limb of first arch; scales small, strongly ctenoid, the rows above lateral line not parallel with it, but running obliquely upward and backward, about 9 or 10 rows between lateral line and base of first dorsal spine and 7 or 8 between lateral line and first soft ray of dorsal; dorsal fin deeply notched, but continuous, the third and fourth spines generally longest, 2.5 to 3.2 in head; caudal somewhat forked, the lobes pointed; anal with only 2 well-developed spines, the third scarcely differentiated from the soft rays, not divided, though not pungent (a condition presumably pertaining because of extreme youth), origin of fin almost directly opposite that of soft dorsal, second anal spine 6.0 to 7.0 in head; ventral inserted very slightly behind base of pectoral, with a rather slender spine, 3.2 to 3.5 in head; pectoral pointed, reaching a little beyond tip of ventral, 4.1 to 5.0 in length, 1.4 to 1.75 in head.

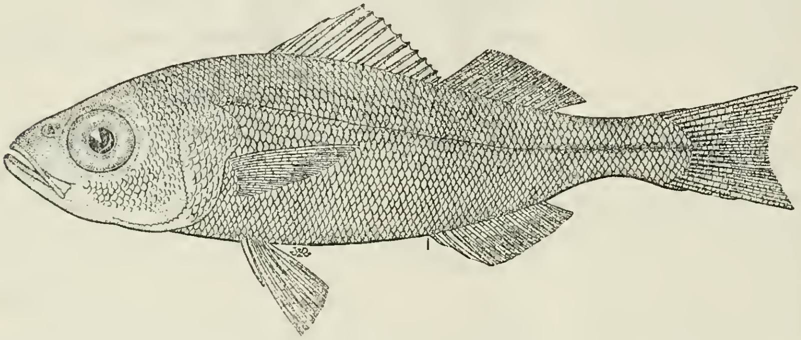

Figure 51.—*Xenistius peruanus*, new species. From the type, 55 mm. long, Lobos de Tierra Island, Peru (A.M.N.H. No. 16202).

Color brownish, a little lighter above than below; a dark line on middle of caudal peduncle, extending forward about to a point above origin of anal, following lateral line on caudal peduncle, but continuing a straight course forward where lateral line bends upward; upper parts of head and body with numerous dusky points, extending on fins.

The foregoing description is based on 10 specimens, 43 to 55 mm. (34 to 45 mm. to base of caudal) long, from Lobos de Tierra Island, kindly lent for study by J. T. Nichols, of the Americal Museum of Natural History. A specimen 55 mm. (45 mm. to base of caudal) long has been selected as the type (A.M.N.H. No. 16202). The following proportions and enumerations are based on the type: Head in length 2.8; depth 3.4; pectoral 5.0. Eye in head 3.4; snout 4.7; interorbital 5.7; maxillary 3.5; caudal peduncle 4.4; longest dorsal spine 3.2; second anal spine 6.0; ventral spine 3.5; pectoral 1.75. D. XIII, 14; A. III, 13 (or II, 14); P. 17; scales 9–75; gill rakers 11+21.

This species differs from *X. californiensis* Steindachner in having 13 instead of 12 spines in the dorsal fin; and generally in having 12 or 13 rays in the anal, instead of usually having only 11. In the 10 specimens studied 1 has 11 rays, 7 have 12 rays, and 2 have 13. In 8 specimens of *X. californiensis* 7 have 11 rays and 1 has 12. The scales in *X. peruanus* are notably smaller, about 70 to 80 (not always easily enumerated because of the small size and condition of the specimens) in a longitudinal series, the rows above the lateral line anteriorly being quite oblique, with about 10 between the lateral line and base of first dorsal spine and about 7 or 8 between it and the base of the first soft ray of dorsal. *X. californiensis* has 60 to 64 scales in a longitudinal series in 8 specimens examined, the rows are parallel with the lateral line, and there are 8 rows between the lateral line and base of first dorsal spine and 6 between it and the base of first soft ray of dorsal. The head is larger, and the maxillary, the spine of ventral fin, and the pectoral fin are shorter in *X. peruanus*. However, these differences may not be of any importance, as the specimens measured are of very unequal size, those of *californiensis* being much larger, ranging from 125 to 190 mm. in length. The specimens of *X. californiensis* have about 6 dark longitudinal stripes on the upper half of the side. The small specimens of *X. peruanus* are plain, with a single narrow dark line on middle of caudal peduncle, extending forward to a point near the vertical from origin of anal where it becomes obscure and disappears.

The small specimens, serving as type material of *X. peruanus*, have only two anal spines, the third ray although undivided is flexible. In placing the species in this genus it is necessary to assume that the third ray will develop into a spine. In all other respects the specimens meet the definition of the genus.

Range.—Lobos de Tierra Island, and North Chincha Island, Peru.

Family GERRIDAE: Mojarras

Body elongate to rather short and deep, compressed; head rather small, pointed; mouth usually small, extremely protractile; spine of premaxillaries extending above eyes; maxillary without a supplemental bone, not slipping under the narrow preorbital; each jaw with small pointed teeth; no teeth on vomer, palatines, or tongue; nostrils double; gills 4, the membranes separate, free from isthmus; lateral line complete, usually paralleling outline of back; scales large, forming a sheath at base of dorsal and anal; dorsal fin continuous, sometimes deeply notched, with 9 or 10 spines and about an equal number of soft rays; anal with 2 or 3 spines and with about 7 to 9 soft rays; ventrals inserted slightly behind pectorals, each with a fairly strong spine and 5 soft rays.

Two genera are represented in the Peruvian collections studied.

KEY TO THE GENERA

a. Preopercle without serrations, the margin being entire; second dorsal and second anal spines not greatly enlarged................ **Gerres** (p. 238)
aa. Preopercle distinctly serrate; second dorsal and second anal spines notably enlarged.. **Diapterus** (p. 240)

Genus GERRES Cuvier, 1924

Body moderately elongate, compressed; preorbital and preopercle entire; second dorsal and second anal spines not greatly enlarged; second interhaemal spine long, spear-shaped.

A single widely distributed species ranges into Peru.

GERRES CINEREUS (Walbaum)

CHAVELA

Mugil cinereus WALBAUM, 1792, p. 228, Bahamas (description based on Catesby pre-Linnaean).
Xystaema cinereus JORDAN and EVERMANN, 1898, p. 1372, fig. 556 (description; range; synonymy).
Xystaema simillimum EVERMANN and RADCLIFFE, 1917, p. 91, Río de Eten, Eten, Peru (synonymy; description).
Gerres cinereus MEEK and HILDEBRAND, 1925, p. 589, both coasts of Panama (synonymy; description; range).

Head 2.9 to 3.1; depth 2.2 to 2.6; D. IX, 10; A. III, 7; P. 15; scales 41 to 44.

Body rather strongly compressed, its greatest thickness scarcely a third its depth; back elevated; profile from snout to nape nearly straight; outline under snout and anterior part of eye dropping rather abruptly, slightly concave; head rather small, compressed; caudal peduncle fairly slender, 2.7 to 2.8 in head; snout abruptly pointed, 3.5 to 4.0; eye 2.7 to 3.1; interorbital 3.5 to 3.8; mouth small, nearly horizontal, terminal; maxillary reaching slightly beyond anterior margin of eye, 2.8 to 3.1 in head; teeth in jaws small, pointed, in a narrow band in each jaw; premaxillary groove broad, not restricted anteriorly, free from scales; gill rakers small, shorter at angle than anteriorly on lower limb of first arch, 7 or 8 more or less developed on lower and 3 or 4 on upper limb of first arch; scales moderate, with thin membranous edges, rows above lateral line parallel with it, 5 between it and base of first dorsal spine, and only 4 complete rows below base of first soft ray, extending on base of caudal and ventral, and forming a broad sheath at base of dorsal and anal; dorsal spines fairly slender, the third usually longest, 1.7 to 1.8 in head; caudal deeply forked, the lobes pointed, of about equal length, longer than head; anal spines moderate, the second somewhat stronger than the third, reaching to or not quite to tip of the third, 1.8 to 2.4 in head; ventral reaching to or beyond vent, inserted just behind base of pectoral, with a slender spine contained 1.8 to 2.1 in head; pectoral long, the fifth ray (counting downward) usually longest, reaching to or a little beyond origin of anal, longer than head, 2.7 to 3.0 in length.

Color grayish above; pale below, with a slight silvery sheen; sides of the larger specimens with about 8 irregular and indefinite dark vertical bars, missing in the smallest specimen (48 mm. long); fins mostly pale, membranes between spines of dorsal and anal dusky, the tip of spinous dorsal of the smallest specimen conspicuously black. Largely silvery in life.

Four specimens from Peru, respectively 48, 115, 120, and 125 mm. long, form the bases for the description. The three larger specimens were secured in the Río de Eten, at Eten, by R. E. Coker, and the smallest one was taken in Chimbote Bay by the Mission. The species apparently is not numerous on the coast of Peru.

Regan (1907, p. 38) claimed that Pacific coast specimens have "fewer scales, larger head, longer maxillary, and longer second anal spine, whilst the bars on the sides are usually more numerous." In his key to the species, Regan gave as a distinguishing character "5 or 5½ scales between the lateral line and middle of dorsal fin" for the Atlantic specimens and only 4 for the Pacific. Regan, then, named the Pacific coast representatives *G. simillimus*. Meek and Hildebrand (1925, p. 589), who had 35 specimens from the Atlantic coast of Panama, and 5 from the Pacific, who had studied additional specimens from Panama and elsewhere contained in the U. S. National Museum collection, and who had especially checked the supposed differences mentioned by Regan, stated, "We are unable to detect any difference, whatever, between the Atlantic and Pacific representatives." Accordingly, they synonymized *G. simillimus* with *G. cinereus*. However, Jordan, Evermann, and Clark (1930, p. 342) did not see fit to follow Meek and Hildebrand but gave *G. simillimus* full specific rank.

I have now rechecked Meek and Hildebrand's original data and have analyzed further data based on recently collected specimens from the coasts of Panama, and the Peruvian material described above, and have found no reason for altering the earlier conclusion. In 26 specimens from the Atlantic, 23 have 4 major rows of scales between the lateral line and the middle of the dorsal, 2 have only 3, and 1 has 5. In 22 specimens from the Pacific there is no variation in the number of major rows, which is constantly 4, though often an additional "half row" is present. In a lateral series, counted just above the lateral line, 21 specimens from the Atlantic have 40 to 44, the average being 42.1. Similarly, 15 specimens from the Pacific have 39 to 44, the average number being 42.0. Neither is it possible to demonstrate a difference in the length of the head. In 25 specimens from the Atlantic, 55 to 260 mm. long, the head is contained 2.75 to 3.2 times in the length, and in 21 specimens, 50 to 225 mm. long from the Pacific, 2.9 to 3.3 times. The maxillary extends slightly beyond the anterior margin of the eye in all the specimens studied. As to its proportionate length the measurements are unsatisfactory, as in many specimens the highly protractile premaxillaries are drawn forward, causing a distortion. The second spine of the anal is very variable in length, and therefore its proportionate length does not seem to be of any specific value, for example, in 7 small specimens from the Atlantic its length in the head varies from 2.0 to 3.4, and in 6 small specimens from the Pacific the range is 1.6 to 2.5.

The number of dorsal spines and rays is constantly IX, 10, and for the anal III, 7 in all specimens from each coast examined. Other proportions, in which those for Atlantic specimens in each instance are stated first, are: Depth in length 2.25 to 2.5, 2.25 to 2.5; pectoral 2.6 to 2.7, 2.6 to 2.7. Eye in head 2.7 to 3.25, 2.5 to 3.25; snout 2.25 to 3. 6, 2.75 to 3.36; interorbital 3.2 to 3.7; 3.3 to 3.8; caudal peduncle 2.6 to 3.0, 2.65 to 3.0.

Range.—Both coasts of America; on the Atlantic from Florida to northern South America, and on the Pacific from Baja California to Peru.

Genus DIAPTERUS Ranzani, 1840

Body rather short and deep, quite compressed; preopercle, and sometimes preorbital, serrate; second or third dorsal spine, and second anal spine rather long, and more or less enlarged; second interhaemal spine long, spear-shaped, not hollow.

KEY TO THE SPECIES

a. Preorbital entire; dorsal with 9 spines and 9 or 10 soft rays.
peruvianus (p. 240)
aa. Preorbital distinctly serrate; dorsal with 10 spines and 9 soft rays.
periche (p. 241)

DIAPTERUS PERUVIANUS (Cuvier and Valenciennes)

PERICHE

Gerres peruvianus CUVIER and VALENCIENNES, 1830, p. 467, Paita, Peru (original description).—EVERMANN and RADCLIFFE, 1917, p. 92, Capon, Peru (references; description).

Diapterus peruvianus MEEK and HILDEBRAND, 1925, p. 597, Panama Bay, and adjacent brackish tide streams (synonymy; description; range).—TORTONESE, 1939b, p. 304, Callao, Peru.

Head 2.9 to 3.05; depth 1.9 to 2.0; D. IX, 9 or 10; A. III, 8; P. 15 or 16; scales 35 to 38.

Body short, deep, rather strongly compressed, its greatest thickness about a third its depth; back high; profile from snout to nape straight, or even slightly concave over the eyes; outline under snout and anterior part of eye dropping rather abruptly, slightly concave; caudal peduncle short, strongly compressed, 2.4 to 2.5 in head; snout moderately pointed, 3.7 to 3.8; eye 2.5 to 3.1; interorbital 2.5 to 3.4; mouth small, terminal, nearly horizontal; maxillary reaching about opposite front of pupil, 2.6 to 2.7 in head; teeth small, pointed, in a band in each jaw; premaxillary groove broad, slightly constricted anteriorly, scaleless; preorbital very narrow, entire; angle and lower margin of preopercle strongly serrate; gill rakers short, broad, not longer at angle than anteriorly, shorter than pupil, 13 or 14 on lower and about 2 to 4 on upper limb of first arch, preceded by a variable number of small points; scales rather large, fairly adherent, rather thin, with membranous borders, extending on base of caudal and ventral, and forming a sheath at bases of dorsal and anal; dorsal spines slender, the second somewhat enlarged, though not always as long as the third, 1.0 to 1.15 in head; caudal deeply forked, the lobes pointed, of about equal length, notably longer than head; second anal spine moderately enlarged, reaching nearly or quite to tip of third spine, 1.3 to 1.5 in head; ventral reaching nearly or quite to origin of anal, inserted a little behind base of pectoral, with a rather strong spine contained 1.5 to 1.8 in head; pectoral long, pointed, extending somewhat beyond tip of ventral, the fifth and sixth rays (counting downward) longest, equal to or longer than head, 2.7 to 3.0 in length.

Color of old preserved specimens brownish above; pale silvery below. Color of fresh specimens largely silvery, with dark stripes along the rows of scales in large specimens.

A single specimen, 80 mm. long to base of caudal (caudal fin broken), from Peru is at hand. This small fish was secured at Capon by R. E. Coker. The foregoing description is based on this specimen and on three others from Guayaquil, Ecuador, 64, 67, and 95 mm. long to base of caudal. These were compared with others from Panama and El Salvador, with which they seem to agree in virtually all respects.

Range.—Mazatlán, Mexico, to northern Peru.

DIAPTERUS PERICHE (Evermann and Radcliffe)

PERICHE

FIGURE 52

Gerres periche EVERMANN and RADCLIFFE, 1917, p. 93, pl. 8, fig 3, Tumbes, Peru (original description; discussion of relationship).

Diapterus periche MEEK and HILDEBRAND, 1925, p. 603, Tumbes, Peru (redescribed from the type).

Head 2.8; depth 2.0; D. X, 9 (slightly abnormal); A. III, 9; P. 16; scales 38.

Body short, rather compressed, its greatest thickness only about a third of its depth; back high; profile from snout to nape rather steep, slightly concave over eye; caudal peduncle short, 3.0 in head; snout pointed, 2.9; eye 3.9; interorbital 3.4; mouth moderate; lower jaw included; maxillary reaching front of pupil, 2.6 in head; teeth not evident; premaxillary groove broad, free from scales; preorbital very narrow, with an indentation under anterior part of eye, distinctly serrate in front of and behind indentation; preopercle serrate; gill rakers quite short, 13 on lower limb and about 8 on upper limb of first arch; scales large, with irregular membranous margins, forming a broad sheath on bases of dorsal and anal, extending on caudal, ventral, and slightly on pectoral; dorsal spines strong, the second enlarged, a little longer than the third, 1.6 in head; second spine of anal very strong, not reaching tip of third, 1.9 in head; ventral inserted slightly behind pectoral, failing to reach anal by about half diameter of eye, with a strong spine contained 2.1 in head; pectoral long falcate, extending a little beyond tip of ventral, almost as along as head, 3.3 in length.

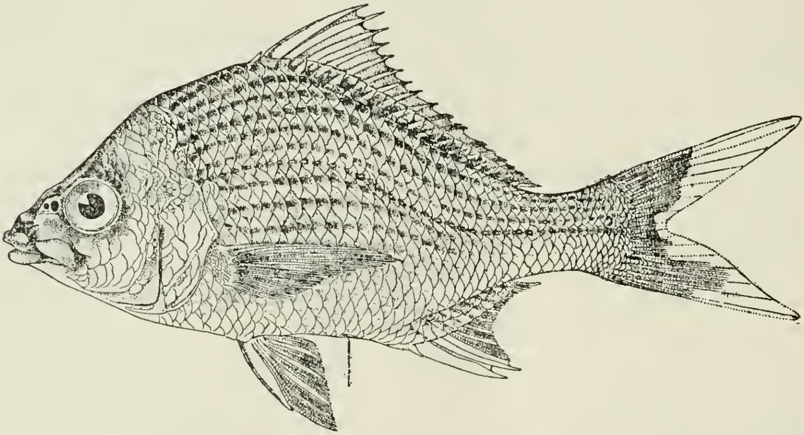

Figure 52.—*Diapterus periche* (Evermann and Radcliffe). From the type, Tumbes, Peru (U.S.N.M. No. 77743). (After *Gerres periche* Evermann and Radcliffe, 1917.)

Color, as described by Evermann and Radcliffe (see reference above), "Silvery, tinged with yellow, a black line along each row of scales above base of pectoral, about 9 of these black lines; no black area in axil of pectoral." The color of the specimen remains about as described after many years' emersion in alcohol.

The description is based on the type (U.S.N.M. No. 77743), the only specimen known, which is about 255 mm. (198 mm. to base of caudal) long and was taken at Tumbes by R. E. Coker. This species, as represented by the type, differs from *D. peruvianus* in having a serrated preorbital.

Range.—Known only from Tumbes, Peru.

Family POMADASIDAE: Grunts

Body more or less elongate; the back generally elevated; head large, blunt or rather pointed; mouth large or small, more or less horizontal, low, usually terminal; premaxillaries protractile; maxillary without a supplemental bone; teeth pointed or conical, no canines, wanting on vomer, palatines, and tongue; preopercle usually serrate; opercle without spines; branchiostegals 6 or 7; gills 4, a slit behind the fourth; gill membranes separate and free from the isthmus; lateral line complete, usually not extending on caudal fin; scales moderate or rather large, firm, ctenoid; dorsal fin single, more or less deeply notched, with 10 to 14 strong spines, depressible in a groove; caudal more or less concave; anal with 3 spines, the soft part of fin similar to that of dorsal, though generally shorter; ventral fins thoracic, each with a rather slender spine and 5 soft rays.

KEY TO THE GENERA

a. Margin of preopercle rather strongly serrate, 1 or more serrae at angle much enlarged, those on its horizontal limb directed forward; body rather elongate, little compressed, the depth about 3.33 in length -----**Conodon** (p. 243)

aa. Margin of preopercle finely serrate, the serrae at angle if present not much enlarged, those on its horizontal limb if present not directed forward; body usually deeper and more compressed.

  b. Anal fin short, with 6 to 8 soft rays; scales moderately small, about 65 to 80 oblique series on side above lateral line.

    c. Body fairly elongate; back not greatly elevated; depth about 2.8 to 3.4 in length; gill rakers well developed, 20 to 25 on lower limb of first arch-- **Isacia** (p. 246)

    cc. Body deeper; back rather strongly elevated; depth about 2.0 to 2.5 in length; gill rakers small, about 12 to 14 on lower limb of first arch.

      d. Anal spines small, more or less graduated, the second scarcely if at all stronger than the third; lips thin; no scales on dorsal or anal. **Orthopristis** (p. 248)

      dd. Anal spines much stronger, the second usually notably longer and stronger than the third; lips thick; small scales on interradial membranes of soft parts of dorsal and anal-- **Anisotremus** (p. 249)

  bb. Anal fin longer, with 9 to 13 soft rays; scales larger, about 45 to 55 oblique series on side above lateral line.

    e. Small scales present on interradial membranes of soft parts of dorsal and anal; ventral fins inserted behind base of pectorals. **Brachydeuterus**, (p. 252)

    ee. Scales wanting on interradial membranes of soft parts of dorsal and anal; ventral fins inserted under base of pectorals- **Pomadasys** (p. 256)

Genus CONODON Cuvier and Valenciennes, 1830

Body rather elongate, somewhat robust; back not greatly elevated; mouth moderate, oblique; maxillary generally reaching below anterior part of eye; teeth in each jaw in a band, the outer ones in each jaw more or less enlarged, conical; preopercular margin rather strongly serrate, with one or more serrae at angle enlarged, those on horizontal limb directed forward; soft dorsal and anal each with a low sheath of scales at base, and with small scales on interradial membranes; second anal spine generally enlarged; anal with three rather strong spines and seven or eight soft rays.

A single species, which apparently is new, comes within the scope of the present work.

CONODON MACROPS, new species

OJO DE UVA

FIGURE 53

Conodon serrifer EVERMANN and RADCLIFFE (not of Jordan and Gilbert), 1917, p. 82, pl. 8, fig. 2, Capon, region of Tumbes, Peru (references, but apparently not pertaining to this species; description).

Head 3.17; depth 3.3; D. XII, 12; A. III, 7; P. 16; scales 50.

Body rather elongate, compressed, its greatest thickness somewhat greater than half its depth; back rather low; dorsal profile anteriorly gently convex; ventral outline gently convex; head rather low and long; caudal peduncle long, compressed, 3.25 in head; snout fairly blunt, 3.6; eye large, 3.8; interorbital 3.8; preorbital narrow, 10.8; mouth oblique; lower jaw projecting; maxillary reaching nearly opposite anterior margin of pupil, 2.7 in head; teeth in each jaw in a band, the outer ones in each jaw enlarged (but less so than in the other species of the genus); margin of preopercle denticulate, its angle greatly produced, with a very large spine, the first 2 spines below and in advance of it directed downward and backward, the rest on horizontal limb directed more or less forward; gill rakers slender, those at angle about as long as pupil, 15 on lower and 6 on upper limb of first arch; scales firm, slightly ctenoid on middle of body below lateral line, cycloid elsewhere, 7 longitudinal rows of scales between lateral line and base of first dorsal spine, 5 between lateral line and base of first soft ray of dorsal; dorsal deeply notched, the fourth spine longest, 1.8 in head; anal spines stronger than dorsal spines, the second somewhat longer than the third, but scarcely stronger, 2.1 in head; ventral inserted a little behind base of pectoral, the spine rather long and slender, 2.1 in head; pectoral long, pointed, the sixth and seventh ray (counting downward) longest, reaching well beyond tip of ventral, 1.1 in head, 3.5 in length.

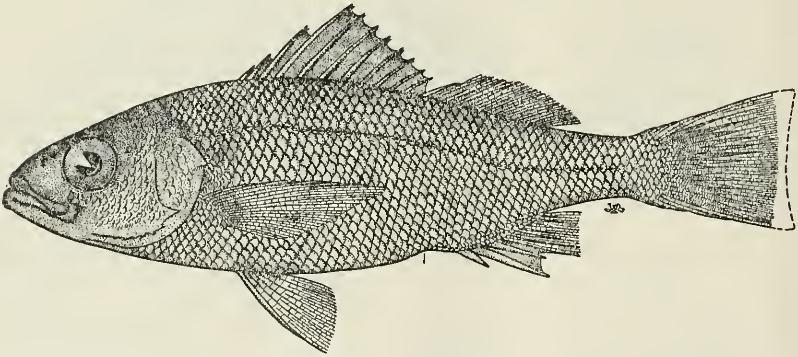

FIGURE 53.—*Conodon macrops*, new species. From the type, 255 mm. long, Capon, Peru (U.S.N.M. No. 77632)

"Color in alcohol, brown; silvery reflections on belly, traces of about seven blackish bars on sides" (Evermann and Radcliffe). The specimen may have become even darker since the foregoing description was written, as the dark bars have virtually disappeared.

The description is based on the specimen (U.S.N.M. No. 77632) described by Evermann and Radcliffe (see reference above) as *C. serrifer*, which is the only one of this apparently new species among the collections studied. This specimen, which becomes the type, is now 255 mm. (205 mm. to base of caudal) long and was taken at Capon, in the vicinity of Tumbes, by R. E. Coker. It was compared with a specimen (U.S.N.M. No. 80542), of exactly the same size, from Panama Bay, which in turn was compared with the smaller type specimens (U.S.N.M. No. 17546) of *C. serrifer*, 151 and 167 mm. long to base of caudal. The specimen from Panama apparently is identical with the type material of *C. serrifer*, which is from Boca Soledad, west coast of Baja California.

The Peruvian specimen differs from the Panama Bay specimen, as well as from specimens from the Atlantic coast of Panama, identified as *C. nobilis*, in so many respects that it must be considered a distinct species. The differences between the specimen from Peru and the one from Panama Bay are set forth in the following comparisons. The examples from the opposite coasts of Panama, as already pointed out by Meek and Hildebrand (1925, p. 522), do not seem to be separable, though larger series might reveal differences. Therefore, it is to be assumed that the Peruvian specimen differs from the Atlantic coast specimens in the same characters and to about the same degree as it does from the Panama Bay one, which herein is referred to *C. nobilis*. The Peruvian specimen is named *macrops* because of its big eyes.

C. macrops	*C. nobilis*
Eye large, nearly as long as snout, 3.6 in head.	Eye notably smaller, much shorter than snout, 4.7 in head.
Preorbital scarcely half width of eye, 10.8 in head.	Preorbital nearly as wide as eye, 5.5 in head.
Interorbital broad, 3.8 in head.	Interorbital narrower, 5.1 in head.
Angle of preopercle greatly produced, with a very large spine, the first two spines below angle directed downward and backward.	Angle of preopercle little produced, with a much smaller spine, the first two spines below angle directed downward.
Scales mostly cycloid, those in lateral line somewhat reduced, not striate; 7 horizontal rows between lateral line and base of first dorsal spine, and 5 between lateral line and base of first soft ray of dorsal.	Scales mostly ctenoid, those in lateral line greatly reduced, mostly striate; 5 horizontal rows between lateral line and base of first dorsal spine, and 4 between lateral line and base of first soft ray of dorsal.
Second anal spine a little longer than the third and scarcely stronger, 2.1 in head.	Second anal spine much longer than the third and very much stronger, 1.9 in head.
Pectoral reaching far beyond tip of ventral, 3.5 in length.	Pectoral reaching opposite tip of ventral, 4.0 in length.
Body slender, the depth 3.3 in length.	Body deeper, the depth 2.9 in length.

Range.—Known from only one specimen from Capon, vicinity of Tumbes, Peru.

Genus ISACIA Jordan and Fesler, 1893

Body elongate, moderately compressed; head rather pointed; mouth moderately small, oblique; maxillary reaching about to front of eye; scales moderately small, firm, ctenoid, forming a low sheath on base of soft part of dorsal and anal; gill rakers well developed, about 20 to 25 on lower limb of first arch; dorsal fin rather deeply notched, with 13 spines and about an equal number of soft rays; caudal with a shallow fork; anal with three rather weak graduated spines and about 12 or 13 soft rays.

A single species is known, which inhabits the coasts of Peru and Chile.

ISACIA CONCEPTIONIS (Cuvier and Valenciennes)

Cabinsa

Figure 54

Pristipoma conceptionis Cuvier and Valenciennes, 1830, p. 268, Concepción, Chile (original description).

Isacia conceptionis Abbott, 1899, p. 350, Callao, Peru (generic relations discussed; diagnosis; range).—Steindachner, 1902, p. 116, Callao, Peru (description).—Starks, 1906, p. 789, fig. 9, Callao, Peru (diagnosis).—Evermann and Radcliffe, 1917, p. 89, Santa Rosa Island, Independencia Bay; Mollendo; Guañape North Island; region of Pisco; Callao; and Lobos de Afuera, Peru (discussion of the identity of this species and *I. venusta;* description).—Nichols and Murphy, 1922, p. 509, Chincha Islands, and Pescadores Islands, off Ancon.—Fowler, 1940b, p. 772, fig. 54, "Peru" and Valparaiso, Chile.

Isacia venusta Starks, 1906, p. 789, fig. 10, Callao, Peru (original description; compared with *I. conceptionis*).

Head 2.9 to 3.3; depth 2.8 to 3.4; D. XIII, 13 to 15; A. III, 12 or 13; P. 18 or 19; scales 70 to 80; vertebrae 27 (two specimens dissected).

Body moderately compressed, its greatest thickness about half its depth; back moderately elevated; profile over head gently convex; caudal peduncle rather slender, 3.2 to 3.8 in head; snout pointed, 3.2 to 4.0; eye 3.3 to 5.2; interorbital 3.25 to 5.0; mouth moderate, oblique; lower jaw moderately projecting; maxillary generally extending under anterior margin of eye, 3.2 to 3.9 in head; teeth in each jaw in a narrow band, the outer ones scarcely enlarged; vertical limb of preopercle straight to somewhat concave, finely denticulate, horizontal limb unarmed; gill rakers fairly short, those at angle about half length of eye, 20 to 24 more or less developed on lower and 10 to 14 on upper limb of first arch; scales rather firm, ctenoid, reduced on head, missing on snout, extending more or less on caudal, ventral, and pectoral fins, rows of scales above lateral line not parallel with it, about 9 or 10 complete rows between lateral line and origin of dorsal, 6 (occasionally 5) rows on caudal peduncle between lateral line and median dorsal row, and 7 (occasionally 6) below lateral line and median ventral row; dorsal rather deeply notched, the fourth spine generally longest, much longer than any of the soft rays, 2.0 to 2.5 in head, soft part much shorter than spinous part, with a nearly straight margin; caudal with a shallow fork, the upper lobe the longer, notably shorter than head; anal spines small, graduated, the second about 5.0 to 7.0 in head, the soft part similar to that of dorsal, origin of fin a little behind beginning of soft part of dorsal; ventral inserted just behind base of pectoral, with a very slender spine, the spine 2.3 to 3.0 in head; pectoral long, falcate, the fourth to the sixth rays (counting downward) longest, the rays below abruptly shorter, the longest rays about as long as head, 3.1 to 3.7 in length in adults, proportionately shorter in young.

Color of preserved specimens varying from silvery gray to dark grayish brown above; silvery to a pale punctulate brown below; rows of scales in pale specimens with dark lines, these faintly visible only on lower part of side in dark specimens; fins dusky to nearly black; axil of pectoral black. In some of the specimens the iris remains red. As reddish colors usually fade within a few days, it is interesting to find that a specimen which has been in preservative nearly 45 years still has a reddish eye. Small specimens, around 60 mm. in length, have two dark longitudinal stripes and a dark caudal spot, markings characteristic of many young Pomadasidae. The more prominent dark stripe remains visible in specimens 140 to 160 mm. long, though the caudal spot has disappeared.

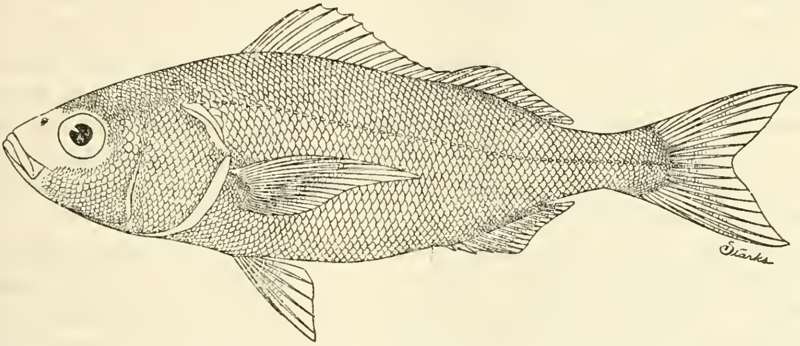

FIGURE 54.—*Isacia conceptionis* (Cuvier and Valenciennes). From the type of *I. venusta* Starks, 220 mm. long, Callao, Peru (U.S.N.M. No. 53467). (After Starks, 1906.)

The Mission furnished 22 specimens, 140 to 300 mm. (110 to 240 mm. to base of caudal) long, which were taken with trammel nets, gill nets, seines, and hand lines. Collections were made at Lobos de Tierra Island, Lobos de Afuera Bay, Guañape Island, Pachacamac Island, Chilca Bay, San Juan Bay, Atico Point, and Coles Point. It is evident from the localities listed here, and those given in the reference cited above, that this species is rather generally distributed along the coast of Peru.

The proportions and enumerations used in the description are based on 19 specimens, unless otherwise stated, ranging in length from 55 to 295 mm. (45 to 230 mm. to base of caudal) long, the smaller specimens used being included in R. E. Coker's collection.

The name "cabinsa," according to the report of the Mission (1943, pp. 25 and 276), is used also for *Paranthias furcifer.* As it seems unlikely that *P. furcifer* is of much commercial value, it probably is correct to assume that the fish marketed as cabinsa are mostly this species, which seems to indicate that it is of considerable commercial value. The usual size of the fish seen in the market is reported to be about 200 mm., and large ones ranged upward to 300 mm.

Range.—Coasts of Peru and Chile.

Genus ORTHOPRISTIS Girard, 1859

Body rather deep, compressed; back fairly high; head deep, compressed; snout usually long, pointed; mouth rather small, low; lips thin; teeth villiform, in a band in each jaw; preopercle usually finely serrate; scales firm, rather small, the series above lateral line not parallel with it, forming a sheath at base of dorsal and anal, and sometimes extending on these fins; dorsal fin not deeply indented, with about 11 to 13 spines and 12 to 15 soft rays; caudal fin with a shallow fork; anal with 3 rather small spines, the second not greatly enlarged, and with about 10 to 13 soft rays.

One species definitely belongs to the Peruvian fauna. A second one, *O. modestus* Tschudi (1845, p. 11), has been described from "Peru." However, the description is such that no one has been able to determine whether it is distinct from the species herein described, or from *O. cantharinus* Jenyns, originally described from the Galápagos Islands. As it seems impossible to determine what *O. modestus* is, no further mention will be made of it.

ORTHOPRISTIS CHALCEUS (Günther)

CORCOVADO

Pristipoma chalceum GÜNTHER, 1864b, p. 146, Panama Bay (original description).
Orthopristis chalceus EVERMANN and RADCLIFFE, 1917, p. 87, Lobos de Afuera, Peru (synonymy; description).—TORTONESE, 1939b, p. 299, Callao, Peru.

Head 3.25; depth 2.5; D. XI, 16; A. III, 11; P. 18; scales 72.

Body rather deep, compressed, its greatest thickness notably less than half its depth; back strongly elevated; profile nearly straight over snout and eye, strongly convex at nape; head deep, compressed; snout fairly long and pointed, 2.6 in head; eye 4.5; interorbital 4.2; preorbital 5.3; mouth nearly terminal, slightly oblique; maxillary not nearly reaching eye, 3.25 in head; teeth villiform, in a band in each jaw, the outer ones scarcely enlarged; vertical margin of preopercle finely serrate, no serrae at angle or on its horizontal margin; gill rakers slender, shorter than pupil, 12 on lower and 7 on upper limb of first arch; scales firm, rather strongly ctenoid, in oblique rows above lateral line, horizontal below it, 10 rows between lateral line and base of first dorsal spine, and 8 between lateral line and base of first soft ray of dorsal, forming a sheath on base of dorsal and anal, but not extending on these fins; dorsal not deeply indented, the fourth spine longest, 2.4 in head; caudal with a shallow fork, the upper lobe the longer; second anal spine a little stronger, but not longer than the third, 4.25 in head; ventral inserted behind base of pectoral, its spine very slender, 2.3 in head; pectoral long, pointed, reaching tip of ventral, the fifth ray (counting downward) the longest, 1.15 in head, 3.7 in length.

"Color shortly after death, dusky silvery with irregular gold stripes, oblique above the lateral line, horizontal below; under side of opercle reddish orange. In alcohol the golden lines along the rows of scales are scarcely discernible; opercular margin dark; general color dusky grayish olive; dorsal and anal dark." (Evermann and Radcliffe.)

The description is based on the same specimen (U.S.N.M. No. 77737), 345 mm. (275 mm. to base of caudal) long, reported by Evermann and Radcliffe (1917, p. 87) from Lobos de Afuera, Peru. This species was not secured by the Mission.

The specimen was compared with several from Panama Bay, all of which are smaller. The Peruvian specimen differs somewhat in having smoother scales, proportionately shorter dorsal and anal spines, and a rather shorter pectoral. These differences probably all may be ascribed to the differences in age and size. It also has only 11 dorsal spines, whereas the Panama specimens have 12. If the differences are of specific value, it cannot be determined from the single specimen now at hand from Peru.

Range.—Gulf of California to northern Peru, and the Galápagos Islands.

Genus ANISOTREMUS Gill, 1861

Body deep, compressed; back rather high; head rather short, blunt; mouth small, low, nearly horizontal; lips thick; maxillary rarely reaching beyond front of eye; teeth in jaws in bands, the outer ones generally somewhat enlarged, conical or pointed; scales moderate to large, ctenoid; dorsal continuous, but deeply notched, the fourth spine generally longest; caudal usually with a shallow fork; anal with 3 strong spines, the second one usually much enlarged, and with about 9 to 13 soft rays.

A single species definitely belongs to the Peruvian fauna.[16]

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[16] Evermann and Radcliffe (1917, p. 81) included *Anisotremus pacifici* in their catalog of the fishes of Peru, stating that it occurs on the Pacific coast from Central America to Peru. However, they had no specimens, and I failed to find it recorded from Peru elsewhere. The southernmost place for which I have found records is Guayaquil, Ecuador, from whence it is reported by Steindachner (1902, p. 115) and by Starks (1906, p. 788). Therefore, it may be expected in northern Peru. If taken it may be distinguished from *A. scapularis* by the notably larger scales (about 45 to 50 vertical series above lateral line) and by having only 11 spines in the dorsal and only 9 or 10 soft rays in the anal. *A. pacifici*, also, generally has several dark cross bars.

ANISOTREMUS SCAPULARIS (Tschudi)

CHITA; SARGO; CORCOVADO

FIGURE 55

Pristipomus scapulare TSCHUDI, 1845, p. 12, Huacho, Peru (original description).

Anisotremus scapularis ABBOTT, 1899, p. 350, Callao, Peru (synonymy, in part incorrect).—EVERMANN and RADCLIFFE, 1917, p. 81, pl. 8, fig. 1, Mollendo, Callao, Ballestas Island, Lobos de Afuera, Lobos de Tierra, and Paita, Peru (references; description; range).—NICHOLS and MURPHY, 1922, p. 509, North Chincha Island and Callao market, Peru.—FOWLER, 1940b, p. 772, Peru.

Head 3.0 to 3.3; depth 2.1 to 2.5; D. XII, 14 to 16 (rarely 17); A. III, 12 or 13; P. 16 or 17 (rarely 18); scales 65 to 73; vertebrae 26 (two specimens dissected).

Body deep, compressed, its greatest thickness notably less than half the depth; back high; profile in advance of dorsal fin strongly convex; snout blunt, especially in large specimens, 3.25 to 4.2 in head, eye 3.0 (in young) to 5.25 (in adult); interorbital 4.0 (in young) to 2.5 (in adult); mouth low, rather small, nearly terminal; lower jaw slightly included; maxillary generally reaching vertical from anterior margin of eye, 3.0 to 4.2 in head; teeth in each jaw in a broad band, the outer ones considerably enlarged, conical or pointed; preopercular margin coarsely serrate at and above its lower posterior angle; gill rakers short, those at angle about as long as pupil, 12 to 14 more or less developed on lower and about 9 to 11 on upper limb of first arch; chin with 3 pores, forming a triangle; scales ctenoid, reduced anteriorly above lateral line, on head, and on chest, extending more or less on all soft rays of fins, missing on snout and mandible, 11 or 12 complete longitudinal rows between lateral line and origin of dorsal, consistently 5 complete rows on caudal peduncle between lateral line and median dorsal row, and 6 rows below lateral line and median ventral row;

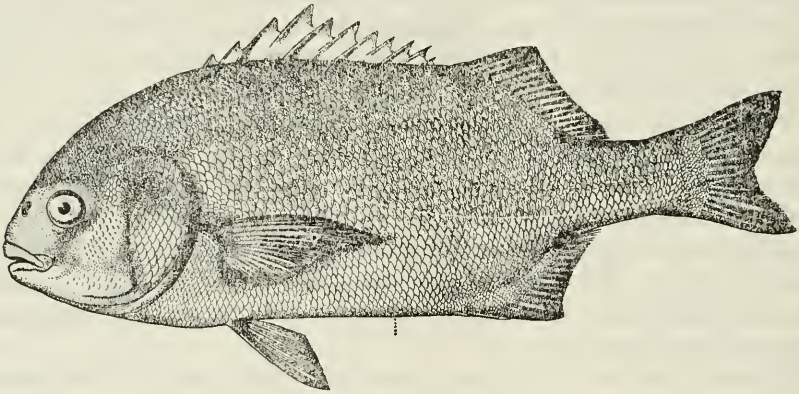

FIGURE 55.—*Anisotremus scapularis* (Tschudi). From a specimen 400 mm. long, Mollendo Peru (U.S.N.M. No. 77683). (After Evermann and Radcliffe, 1917.)

dorsal deeply notched, the fourth spine generally longest, variable, usually a little longer than longest soft rays, 1.9 to 2.6 in head, soft part with a nearly straight to slightly concave margin; caudal with a shallow fork, upper lobe the longer, somewhat shorter than head; anal spines strong, the second rather longer and stronger than the third, 2.2 to 3.4 in head, margin of soft part concave, origin of fin a little behind beginning of soft part of dorsal; ventral inserted a little behind base of pectoral, reaching nearly or quite to vent, shorter in very large specimens, its spine fairly slender, 2.1 to 2.7 in head; pectoral pointed, fifth and sixth (counting downward) rays generally longest, usually about as long as head, 3.0 to 3.9 in length.

Color of preserved specimens varying from grayish to rather dark brown above and from pale silvery to grayish brown below; longitudinal rows of scales on some specimens rather well marked with dark lines; membranous margin of opercle usually rather dark; some specimens with a bar from nape across base of pectoral, appearing only as a dark spot above and below base of pectoral in some specimens; fins in adults generally quite dark; dorsal and anal usually each with a black spot at base of last ray; ventral distally sometimes very dark, with a black axil. In the young the posterior parts of the soft rays of dorsal and anal are pale, and in the very young (under about 50 mm.). the soft dorsal and anal are pale, except for a bit of dusky on the distal part of the anterior rays; other fins also largely or wholly pale.

"Color in life: Silver-gray, slightly olivaceous above; fins dark; opercle margined with black; axil of pectoral black; a black bar crossing base of pectoral externally; a black spot at posterior base of dorsal on back and fin, the spots of the two sides being confluent; similar spots confluent around posterior margin of anal." (Evermann and Radcliffe, after R. E. Coker's field notes.)

The Mission secured many specimens of this species, 15 to 400 mm. (11 to 320 mm. to base of caudal) long, taken at Paita, Lobos de Tierra Bay, Guañape Island, Chimbote Bay, Samanco Bay, Chilca Bay, North Chincha Island, Point Ripio, La Lagunilla, and Viejas Island, in Independencia Bay. I have also had most of the specimens listed by Evermann and Radcliffe (see reference above), and two specimens taken by the Wilkes Expedition. The proportions and enumerations are based on 13 specimens (and some of them on several more), ranging in length from 65 to 400 mm. The young, at least, seem to have been rather common when the collections were made. The 12 adults collected by the Mission were caught either in seines or with trammel nets, and the young with small collecting seines. One specimen is entirely without ventral fins, which it may never have possessed, as no scar is evident.

According to the report of the Mission (1943, p. 276), the "chita" is of some value as a food fish, the principal landings being made at

Huacho-Carquin, Pisco, and Callao. According to R. E. Coker, as reported by Evermann and Radcliffe (see reference above), the meat of this fish is of excellent quality.

Range.—Coast of Peru. Also recorded from the Galápagos Islands, and from Cocos Island.

Genus BRACHYDEUTERUS Gill, 1862

Body elongate, compressed; mouth moderately large, with maxillary extending about under anterior margin of eye; teeth villiform, in a band in each jaw, none on vomer or palatines; preopercle serrate; no spines on opercle; lateral line complete; scales moderately large, firm, ctenoid, forming a very low sheath on base of dorsal and anal, and small scales extending on the interradial membranes of these fins; vertebrae about 26; dorsal with 12 spines and about 13 to 15 soft rays; caudal with a shallow fork; anal with 3 spines, the second little if at all enlarged, generally equal to or shorter than the third, the fin with about 6 to 8 soft rays; ventrals inserted behind base of pectorals in Peruvian species (not checked for other species).

KEY TO THE SPECIES

a. Anal spines graduated, the second notably shorter and not stronger than the third; scales on cheek and opercle large, 6 or 7 horizontal rows below posterior part of eye, and 4 vertical series behind upper part of preopercular margin; preorbital not excessively broad in large specimens, rarely less than 5.5 in head………………………………**nitidus** (p. 252)

aa. Anal spines generally not graduated, the second usually fully as long as the third, and stronger; scales on cheek and opercle smaller, about 8 or 9 horizontal rows (not always in definite series) below posterior part of eye, and 5 vertical series behind upper part of preopercular margin; preorbital very broad in large specimens, only about 3.0 in head……**leuciscus** (p. 254)

BRACHYDEUTERUS NITIDUS (Steindachner)

GALLINAZO

Pristipoma (*Haemulopsis*) *nitidum* STEINDACHNER, 1869a, p. 5, pl. 3, Mazatlán, Mexico (original description).

Brachydeuterus nitidus JORDAN and EVERMANN, 1898, p. 1326 (description; range; synonymy).—EVERMANN and RADCLIFFE, 1917, p. 83, Capon, Peru (description; range).

Head 3.0; depth 2.8; D. XII, 14; A. III, 8; scales 52.

Body compressed, its greatest thickness scarcely more than half its depth; back moderately elevated; profile over head slightly convex; ventral outline gently convex; caudal peduncle moderately long, compressed, 3.0 in head; snout moderate, 3.5; eye 3.5; interorbital 3.5; preorbital 6.25; mouth little oblique, terminal; maxillary extending under anterior margin of eye, 3.5 in head; teeth in a band in each jaw, the outer ones scarcely enlarged; margin of preopercle rather coarsely denticulate, the spines at angle little enlarged; gill rakers slender, scarcely half length of pupil, 14 more or less developed on lower and 6 on upper limb of first arch; scales firm, ctenoid, missing on upper surface of snout, 6 complete longitudinal series between lateral line and origin of dorsal, 4 between lateral line and median dorsal series on caudal peduncle, and 5 between lateral line and median ventral series; 4 vertical series of scales on opercle behind upper free part of preopercular margin, and 6 main horizontal rows between lower posterior margin of eye and lower margin of preopercle; dorsal deeply notched, the fourth spine longest 2.15 in head; anal spines rather slender, graduated, the second much shorter and more slender than the third, 6.0 in head; ventral inserted immediately behind base of pectoral, the spine slender, 3.0 in head; pectoral much longer than ventrals, pointed, nearly as long as head, 3.15 in length.

Color of old preserved specimen grayish brown above; somewhat paler underneath; faint dark lines along the rows of scales below lateral line; a large obscure shoulder spot present; fleshy margin of opercle somewhat darkened; fins all brownish.

Only one specimen, 170 mm. (136 mm. to base of caudal) long, from Peru is at hand. It was taken at Capon (Gulf of Guayaquil) by R. E. Coker. This fish was compared with 10 others, 65 to 220 mm. (52 to 180 mm. to base of caudal) long, from Panama Bay, the Gulf of California, and Mazatlán, Mexico. The following proportions and enumerations are based on 9 specimens, unless otherwise stated: Head 3.0 to 3.4 in length; depth 2.55 to 3.0; pectoral 3.15 to 4.7 (apparently increasing in length with age). Eye 2.7 to 4.0 in head; snout 3.2 to 4.0 (not increasing excessively in length with age); interorbital 3.75 to 5.2; preorbital 5.4 to 12; maxillary 3.0 to 3.5; caudal peducle 2.5 to 3.0; fourth dorsal spine 1.7 to 2.15; second anal spine variable in length, 2.7 to 6.0; ventral spine 2.4 to 3.0; pectoral 1.05 to 1.3 in head. D. XII, 14 or 15; A. III, 8 (7 once); P. 16 or 17; gill rakers 6 to 8+13 to 15; scales 51 to 54, 5 or 6 complete series between lateral line and origin of dorsal, 4 between lateral line and median dorsal row on caudal peduncle, and 5 between lateral line and median ventral row, 4 vertical rows on opercle behind upper part of preopercular margin, and 6 or 7 horizontal rows on cheek below lower posterior part of eye; vertebrae 26 (one specimen from Gulf of California dissected). It is interesting to note that whereas the mouth is terminal in the larger specimens at hand, the lower jaw projects rather prominently in the young. Although the suborbital increases with age, the increase is not nearly so great as in *B. leuciscus*.

The validity of *B. nitidus* has been questioned. In fact, it was synonymized with *B. leuciscus* by Meek and Hildebrand (1925, p. 551). However, it is evident now from the larger series studied that two species are at hand, which can be separated, as characters have now been discovered that seem to be specific. Those used before, namely, the length of the snout and width of the preorbital, vary so much with age that they are not usable unless specimens more or less equal in size are available. Generally, the species may be separated by the shorter and more slender second anal spine in the present species, the spines being definitely graduated, the second one being notably shorter than the third. However, the length and thickness of the second anal spine vary so greatly in *B. leuciscus* that a few of the numerous specimens of that species now at hand cannot be separated by that character alone. More constant characters are the larger scales on the opercle and cheek in the fish herein called *B. nitidus,* as shown in the key to the species and in the description.

It is not certain that the name *nitidus* is available for this species, because Steindachner's figure, published with the original description, shows too many rows of scales on the opercle and cheek, agreeing in that respect with *leuciscus.* No mention of the scales on the opercle and cheeks is made in the description. Perhaps the illustrator did not represent the number of rows correctly. The relative size of the anal spines, the length of the snout, and the width of the preorbital apparently are correctly shown, as well as described (though the length of the single specimen studied is not stated), for the species herein called *nitidus.* It apparently will be necessary to examine the type to determine definitely whether *B. nitidus* (Steindachner) is this species, or *B. leuciscus* (Günther).

Range.—Gulf of California to northern Peru. Not abundant anywhere so far as known.

BRACHYDEUTERUS LEUCISCUS (Günther)

RONCADOR; RONCADOR DE AGUA DULCE

Pristipoma leuciscus GÜNTHER, 1864b, p. 147, San José, Nicaragua, and "Chiapam" (original description); 1869, p. 416, pl. 66, fig. 3, San José, Guatemala, "Chiapam," and Panama City (description).—STEINDACHNER, 1879b, pp. 30, 52, pl. 9, fig. 2, Tumbes, Peru (three examples from Tumbes described and compared with others from Panama, etc.: two from Tumbes described as very slender, one of these illustrated and labeled on p. 52, "*Pristipoma leuciscus* Gthr., variat. *elongata* Steind.").

Brachydeuterus leuciscus EVERMANN and RADCLIFFE, 1917, p. 84, Tumbes and Capon, Peru (synonymy; description; range).

Pomadasys leuciscus MEEK and HILDEBRAND, 1925, p. 551, Panama Bay (synonymy, *P. nitidus* apparently wrongly included; description; range).

Head 2.8 to 3.2; depth 3.0 to 3.1; D. XII, 14 or 15; A. III, 7 or 8; P. 17; scales 50 to 54.

Body rather strongly compressed, its greatest thickness about half its depth; back elevated; profile over head nearly straight; ventral outline in advance of anal nearly straight; caudal peduncle long, compressed, 2.7 to 3.4 in head; snout moderately pointed, increasing in proportionate length with age, 2.5 to 3.5; eye 3.7 to 4.7; interorbital 5.2 to 5.6; preorbital increasing greatly in width with age

4.4 to 7.3; mouth little oblique, about terminal; maxillary extending under anterior margin of eye in small specimens, far in front of this point in large ones, 3.15 to 3.8 in head; teeth in each jaw in a rather broad band, the outer ones in upper jaw slightly enlarged; margin of preopercle rather coarsely denticulate, the spines at angle not especially enlarged; gill rakers shorter than pupil, 12 or 13 more or less developed on the lower and 5 to 8 on the upper limb of first arch; scales firm, ctenoid, missing on upper surface of snout, those on side with many accessory scales on base in large examples, 6 or 7 complete longitudinal series between lateral line and origin of dorsal, 4 between lateral line and median dorsal series on caudal peduncle, and 5 between lateral line and median ventral series; 5 vertical series of scales on opercle behind upper part of margin of preopercle, and about 8 or 9 horizontal rows on cheek below lower posterior margin of eye (not always in definite series); dorsal rather deeply notched, the spines fairly slender, the third or fourth generally longest, the latter 1.7 to 2.1 in head; anal spines fairly strong, the second not longer, though generally notably stronger than the third, 2.0 to 3.2 in head; ventral inserted immediately behind pectoral, with a slender spine contained 2.5 to 2.7 in head; pectoral notably longer than ventral, especially in adult, 1.35 to 1.4 in head, 3.8 to 4.4 in length.

Color of a small, rather recently preserved specimen, plain gray above; silvery below; dorsal and caudal somewhat dusky; other fins translucent. Larger specimens preserved a long time are darker, with dark lines along the rows of scales below lateral line, an obscure dark shoulder spot, and with a dark margin on opercle above posterior angle.

Three specimens, respectively 90, 120, and about 215 mm. (70, 96, and 172 mm. to base of caudal) long, from Lobos de Tierra Bay and the Gulf of Guayaquil at Capon and Tumbes, form the basis for the description. The smallest specimen was furnished by the Mission and the other two by R. E. Coker. The species probably is not abundant in Peru, though its genus is mentioned in the report of the Mission (1943, p. 287) with *Pomadasys*, also known as "roncador," as of slight commercial value.

The specimens from Peru were compared with a rather large series from Panama and from Mexico. Much variation with age and growth takes place. The snout becomes very long with age and the preorbital very wide; the pectoral becomes longer; and the dorsal and anal spines appear to become proportionately shorter. The following proportions and enumerations are based on 11 specimens, 80 to 265 mm. (66 to 210 mm. to base of caudal) long. The wide range in some of the proportions are indicative of relatively great changes as the growth of the fish proceeds. Head in length 2.8 to 3.2; depth 3.0 to 3.4; pectoral 3.8 to 4.7. Eye in head 3.1 to 4.8; snout 2.45 to 3.5;

interorbital 5.0 to 6.4; preorbital 2.9 to 9.2; maxillary 2.7 to 3.8; caudal peduncle 2.8 to 3.4; fourth dorsal spine 1.7 to 2.1; second anal spine 2.0 to 3.3; ventral spine 2.3 to 2.9; pectoral 1.2 to 1.5. D. XII, 14 or 15 (rarely 13); A. III, 7 or 8; P. 17; gill rakers 6 to 8+11 to 15; scales 50 to 56, 6 or 7 longitudinal rows between lateral line and origin of dorsal, 4 on caudal peduncle between lateral line and median dorsal series, and 5 between lateral line and median ventral series, 5 vertical rows on opercle behind upper part of margin of preopercle, and about 8 or 9 (not always in definite series) on cheek below posterior part of eye; vertebrae 26 (1 specimen from the Gulf of California dissected).

Range.—Baja California to northern Peru.

Genus POMADASYS Lacepède, 1802

Body elongate, compressed; back usually not very high; eye moderate to large; mouth rather small, terminal; maxillary usually not reaching anterior margin of eye; teeth villiform, a band in each jaw; margin of preopercle serrate, serrae below angle not antrorse; gill rakers small, about 9 to 15 more or less developed on lower limb of first arch; scales rather large, forming a low sheath at base of soft dorsal and anal, no scales on membranes of these fins; dorsal with about 11 to 13 spines, and about an equal number of soft rays; anal with three spines and usually with 7 or 8 soft rays, the second spine greatly enlarged; ventrals inserted under base of pectorals in Peruvian species (not checked for other species).

This genus and *Brachydeuterus* are very close, differing principally in the absence of small scales on the interradial membranes in *Pomadasys.* Two species of *Pomadasys*, both from the Gulf of Guayaquil, come within the scope of this catalog.

Two species are known from Peru. Although the Mission did not furnish specimens, this genus is listed in the report (1943, p. 278) with *Brachydeuterus* as of slight commercial value.

KEY TO THE SPECIES

a. Eye very large, notably elongate, about 3.3 in head; dorsal with 12 spines and about 12 soft rays; about 10 gill rakers more or less developed on lower limb of first arch.......................... **branickii** (p. 256)

aa. Eye smaller, not notably elongate, about 4.6 in head; dorsal with about 12 spines, and 13 soft rays; about 14 gill rakers more or less developed on lower limb of first arch................................ **schyri** (p. 257)

POMADASYS BRANICKII (Steindachner)

RONCADOR

Pristipoma branickii STEINDACHNER, 1879b, p. 28, pl. 9, fig. 1, Tumbes, Peru (original description).

Pomadasis branicki EVERMANN and RADCLIFFE, 1917, p. 86, Capon, vicinity of Tumbes, Peru (description, based on one specimen).—MEEK and HILDEBRAND, 1925, p. 555, Panama Bay (synonymy; description; range).

Head 2.9; depth 2.9; D. XIII, 12; A. III, 7; P. 16; scales 50.

Body moderately compressed, its greatest thickness about half its depth; back moderately elevated; profile over head convex; ventral outline in advance of anal gently convex; head moderately deep, compressed; snout rather long and blunt, 3.0 in head; eye large, quite elongate, 3.3; interorbital 4.9; preorbital 6.3; mouth little oblique, about terminal; maxillary reaching nearly opposite front of eye, 3.75 in head; teeth villiform, in a band in each jaw, the outer ones in upper jaw very slightly enlarged; vertical margin of preopercle serrate, the serrae at angle somewhat enlarged, horizontal limb mostly smooth; gill rakers slender, shorter than pupil, 10 more or less developed on lower and 5 on upper limb of first arch; scales firm, strongly serrate, including those on interorbital, five complete horizontal rows between lateral line and base of first dorsal spine, three between lateral line and base of first soft ray of dorsal; dorsal rather deeply indented, the fourth spine longest, 1.6 in head; second anal spine much longer than the third, but not as strong as in some related species, reaching slightly beyond tips of longest soft rays, 1.55 in head; ventral inserted under base of pectoral, the spine fairly slender, 2.1 in head; pectoral long, pointed, the fifth ray (counting downward) longest, reaching beyond tip of ventral, to vertical from vent, 1.05 in head, 3.1 in length.

Color of old preserved specimen brownish above; paler and slightly silvery below; fins brown; membrane behind tip of each dorsal spine black.

The description is based on the same specimen (U.S.N.M. No. 77603), about 180 mm. (143 mm. to base of caudal) long, reported by Evermann and Radcliffe (1917, p. 86) from the vicinity of Tumbes. It was compared with specimens from Panama and Mazatlán, with which it agrees almost completely. This species is recognized by the large, elongate eye and the very rough scales on upper surface of head.

Range.—From about Mazatlán, Mexico, to northern Peru.

POMADASYS SCHYRI Steindachner

RONCADOR

Pomadasys schyri STEINDACHNER, 1902, p. 115, pl. 4, fig. 1, Guayaquil, Ecuador (original description; compared with *panamensis* and *macracanthus.*—EVERMANN and RADCLIFFE, 1917, p. 85, Tumbes, Peru (description, based on one specimen).

Head 2.65; depth 2.7; D. XII, 13; A. III, 7; P. 16; scales 47.

Body quite compressed, its greatest thickness less than half its depth; back high and narrow; profile over head nearly straight; ventral outline in advance of anal gently convex; head deep, compressed; snout long, pointed, 2.9 in head; eye moderate 4.6; interorbital 5.3; preorbital 4.75; mouth slightly oblique, terminal; maxillary failing to reach eye, 3.4 in head; teeth in a band in each jaw, villiform, all of about uniform size; vertical margin of preopercle serrate, the serrae at angle farther apart and slightly enlarged, horizontal margin mostly smooth; gill rakers shorter than pupil, 14 more or less developed on lower and 6 on upper limb of first arch; scales firm, rather weakly ctenoid, 6 horizontal rows between lateral line and base of first dorsal spine, 4 between lateral line and base of first soft ray of dorsal: dorsal deeply notched, the fourth spine longest, 1.9 in head; second anal spine greatly enlarged, grooved, much longer than the third, reaching tip of longest soft rays, 1.75 in head; ventral inserted under base of pectoral, the spine rather strong, 2.2 in head; pectoral very long, pointed, the sixth ray (counting downward) longest, reaching far beyond tip of ventral, nearly to origin of anal, 1.1 in head, 2.9 in length.

Color brownish; opercle with an obscure dark blotch, and its marginal membrane above angle slightly darkened; a slight suggestion of a dark bar at nape, and another in advance of dorsal; a small dark spot below base of pectoral; fins brownish.

The description is based on the same specimen (U.S.N.M. No. 77607), 220 mm. (183 mm. to base of caudal) long, reported by Evermann and Radcliffe (1917, p. 85) from Tumbes, Peru. It was compared with specimens from Panama Bay and Mazatlán, Mexico, identified as *P. macracanthus* (Günther), from which it apparently is scarcely distinct, though it does seem to have rather larger scales on the chest and opercle.

Range.—Known only from the Gulf of Guayaquil, in Ecuador and Peru.

Family SCIAENIDAE: Croakers, Drums, etc.

Body generally quite elongate, usually more or less compressed; mouth various, teeth in one or more series or in bands, canines sometimes present, no incisors or molars, no teeth on vomer, palatines, pterygoids, or tongue; maxillary usually broad, slipping at least partly under preorbital; premaxillaries protractile; gills 4; slits and pores usually developed about the mouth; chin often with one or more barbels; lateral line usually following contour of back, extending to end of caudal fin; dorsal fin deeply notched or divided, the second dorsal long; anal with one or two spines; ventral with one spine and five soft rays, inserted below or somewhat behind base of pectoral.

This is a large family including many choice food fishes. Many of the species are capable of making a noise, variously known as croaking, drumming, and grunting. The species are carnivorous, mostly living near shore in warm seas, though a few inhabit fresh water. Eleven genera are represented in the collections from Peru, upon which the present work is based. Five of these previously were not reported from Peru.

KEY TO THE GENERA

a. Lower jaw with a single short stout barbel at tip, or with a row of small slender barbels along inner edge of dentary bones.
  b. Lower jaw with a single barbel at tip.
    c. Anal with a single weak spine; margin of preopercle without bony serrae. **Menticirrhus** (p. 259)
    cc. Anal with 2 spines, the second one rather large; margin of preopercle finely serrate________ **Umbrina** (p. 266)
  bb. Lower jaw with a row of slender barbels along inner edge of dentary bones, forming a tuft at tip; anal with 2 rather small spines. **Paralonchurus** (p. 268)
aa. Lower jaw without barbels.
  d. Either the upper or the lower jaw with a pair of canines anteriorly.
    e. Upper jaw anteriorly with a pair of large recurved canines; mouth very large; lower jaw projecting________ **Cynoscion** (p. 273)
    ee. Lower jaw with a pair of canines near tip; mouth only moderately large, terminal; lower jaw generally not projecting_____ **Odontoscion** (p. 280)
  dd. Anterior part of jaws without enlarged pairs of canines.
    f. Bones of head rather firm, not especially spongy to the touch; head generally rather narrow, compressed.
      g. Mouth usually more or less horizontal, terminal or more frequently inferior; slits and pores about the mouth well developed; gill rakers short, about 6 to 15 on lower limb of first arch.
        h. Margin of preopercle unarmed, or rarely with a few feeble spines at angle in small specimens________ **Sciaena** (p. 282)
        hh. Margin of preopercle strongly serrate at all ages_ **Ophioscion** (p. 294)
      gg. Mouth somewhat oblique to nearly vertical; lower jaw sometimes projecting; slits and pores about the mouth undeveloped; gill rakers long and slender, about 15 to 25 on lower limb of first arch.
        i. Mouth strongly oblique to nearly vertical; lower jaw projecting; margin of preopercle without bony serrae_________ **Larimus** (p. 296)
        ii. Mouth moderately oblique to nearly horizontal; lower jaw generally not projecting; margin of preopercle strongly serrate. **Bairdiella** (p. 300)
    ff. Bones of head cavernous, often quite spongy to the touch; head generally low and broad.
      j. Margin of preopercle armed with 1 to about 8 bony serrae; eye of moderate size (about 3.5 to 5.5 in head); scales rather large (about 45 to 55 in lateral series), ctenoid________ **Stellifer** (p. 301)
      jj. Margin of preopercle unarmed; eye very small (about 8 to 10 in head); scales very small (about 80 to 120 in lateral series), mostly cycloid. **Nebris** (p. 309)

Genus MENTICIRRHUS Gill, 1861

Body rather elongate, little compressed; head long, rather low; snout subconical, projecting beyond premaxillaries, with slits and pores above premaxillaries; mouth horizontal, inferior; lower jaw with a single, short, thickish barbel at tip; teeth in each jaw in a more or less definite band, the outer ones in upper usually somewhat enlarged; preopercle with a membranous margin; gill rakers short, tubercular or obsolete; dorsal with about 10 to 13 flexible spines, and about

19 to 27 soft rays; anal small, with a single small slender spine, and about 7 to 9 soft rays.

The species of this genus generally are regarded as good food fishes. However, none appear to be listed among the commercial fishes of Peru, probably because they are not numerous enough. Although the number of scales in a lateral series is used in the key to the species, owing to their irregularity they cannot be counted with absolute accuracy. However, the differences as used are so great that no overlapping should occur. The number of anal rays seems to be quite constant in any one species.

Four species are included in the collections studied, two of which seem to be new.

KEY TO THE SPECIES

a. Anal with I, 9 rays.
  b. First dorsal with 12 spines; pectoral with 18 or 19 rays, very short, not nearly reaching tip of ventral, 4.8 to 5.7 in length; scales about 80 to 92 in lateral series------------------------------------- **cokeri** (p. 260)
  bb. First dorsal with 10 spines; pectoral with 21 or 22 rays, longer, reaching beyond tip of ventral, 3.6 in length; scales larger, about 60 in lateral series -- **panamensis** (p. 262)
aa. Anal with I, 7 rays.
  c. Scales only moderately small, about 65 in lateral series, 28 vertical series on side between origin of anal and base of caudal; pectoral with 21 rays; first dorsal with 11 spines-------- **paitensis**, new species (p. 263)
  cc. Scales quite small, about 78 to 85 in lateral series, 36 or 37 vertical series on side between origin of anal and base of caudal; pectoral with 18 or 19 rays; first dorsal with 10 spines-------- **rostratus**, new species (p. 265)

MENTICIRRHUS COKERI Evermann and Radcliffe

FIGURE 56

Menticirrhus cokeri EVERMANN and RADCLIFFE, 1917, p. 107, pl. 10, fig. 2, Ancon, Peru (original description; compared with *M. panamensis*).—NICHOLS and MURPHY, 1922, p. 510, North Chincha Island, Peru.

Head 3.4 to 4.0; depth 4.0 to 4.5; D. XII–I, 22 to 24; A. I, 9; P. 19, occasionally 18; scales 80 to 92; vertebrae 23 (one specimen dissected).

Body elongate, compressed, its greatest thickness about two-thirds its depth; back somewhat elevated; ventral outline nearly straight; head low, moderately broad; caudal peduncle compressed, 2.4 to 2.9 in head; snout more or less conical, projecting about half an eye's diameter beyond premaxillaries, 3.6 to 4.3 in head; eye quite small, 4.2 to 6.3; interorbital 3.2 to 4.6; mouth inferior, horizontal; lower jaw included; maxillary reaching about to posterior margin of pupil, 3.2 to 3.5 in head; teeth sharply pointed, scarcely in a band, rather in 3 or 4 series, the teeth of outer series in upper jaw enlarged; preopercle with a finely serrated membranous margin; gill rakers little developed, short and pointed, none longer than pupil, 3 to 7 more or less developed on lower, and 3 to 5 on upper limb of first arch; lateral line arched anteriorly becoming horizontal above end of anal base; scales small, strongly ctenoid, extending slightly on at least anterior parts of bases of second dorsal and anal, also on bases of ventral and pectoral, and covering most of lower two-thirds of caudal, the rows nearly parallel with lateral line anteriorly, becoming oblique under first dorsal, and horizontal under posterior part of second dorsal, 9 or 10 rows between lateral line and first dorsal spine, 36 to 39 vertical series on side between origin of anal and base of caudal; dorsal fins slightly connected, the spines fairly slender, the third and fourth longest, of about equal length, 1.6 to 2.0 in head, the tenth, eleventh, and twelfth spines very short; second dorsal with a slightly convex margin, a little higher anteriorly than posteriorly; upper half of caudal fin slightly concave, the longest rays below lateral line, both lobes rounded; anal with convex margin, the spine very weak, closely adherent to first soft ray, without free tip, origin of fin equidistant from base of ventral spine and vertical from end of dorsal base; ventral inserted rather less than an eye's diameter behind base of pectoral, 1.5 to 1.7 in head; axillary process of pectoral bluntly pointed, about two-thirds length of eye; pectoral rather broadly rounded, not nearly reaching tip of ventral, 1.3 to 1.6 in head, 4.8 to 5.7 in length.

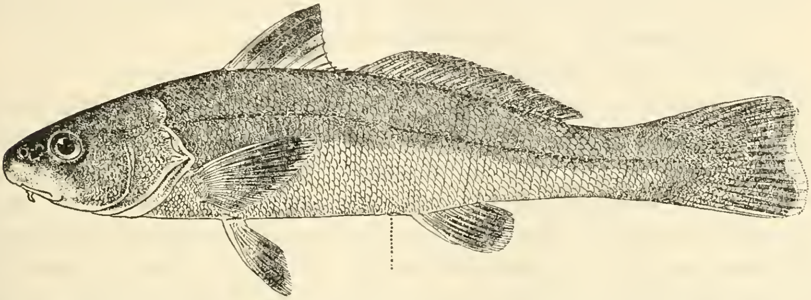

FIGURE 56.—*Menticirrhus cokeri* Evermann and Radcliffe. From the type, 165 mm. long, Ancon, Peru (U.S.N.M. No. 77533). (After Evermann and Radcliffe, 1917.)

Color grayish brown above; pale underneath; first dorsal quite dusky; second dorsal and caudal lighter, the lower lobe of the latter largely quite dark; anal, ventral, and pectoral dark, all with pale margins.

The description is based on 11 specimens, 60 to 120 mm. (45 to 101 mm. to base of caudal) long, furnished by the Mission. Ten of these were seined in Chilca Bay, and one was dredged in San Juan Bay. The type (U.S.N.M. No. 77533), a specimen 165 mm. (134 mm. to base of caudal) long, from Ancon, was compared, and proportions and enumeration based upon it are included in the description. Although the type originally was described as having only 11 spines in the first dorsal, 12 probably is correct, the fin being slightly abnormal anteriorly with the second and third spines fused. However, a groove between them may be detected. A combination of the numerous dorsal spines, rather numerous anal rays, the rather small scales, and the short pectoral fin distinguish this species from other local forms. It is not evident from the description of *M. ophicephalus* (Jenyns), based on poorly preserved specimens from Chile, wherein it differs from the present species. This cannot be determined until specimens from Chile become available for study.

Range.—Known only from Peru.

MENTICIRRHUS PANAMENSIS (Steindachner)

MUCHACHITA

Umbrina panamensis STEINDACHNER, 1875c, p. 9, pl. 9, figs. 1, 2, Panama (original description).

Menticirrhus panamensis EVERMANN and RADCLIFFE, 1917, p. 106, Capon, region of Tumbes, Peru (synonymy; description).—MEEK and HILDEBRAND, 1925, p. 669, Panama Bay (synonymy; description; range).

Head 3.0; depth 4.0; D. X–I, 21; A. I, 9; P. 21; scales 61.

Body quite elongate, somewhat compressed, its greatest thickness nearly three-fourths its depth; back elevated; ventral outline nearly straight; head low, its width and depth about equal at margin of preopercle; caudal peduncle well compressed, 3.4 in head; snout somewhat conical, projecting about half an eye's diameter beyond premaxillaries, 3.4 in head; eye small, 7.2; interorbital 4.2; mouth inferior, horizontal; lower jaw included; maxillary reaching below posterior margin of pupil, 2.9 in head; teeth in a band in each jaw, the outer ones in upper jaw notably enlarged, the rest very small, smaller than those of lower jaw; margin of preopercle with very small and rather few membranous serrae; gill rakers obsolete; lateral line somewhat arched anteriorly, becoming horizontal somewhat behind base of anal; scales moderate, strongly ctenoid, apparently not extending on bases of dorsal and anal fins, very slightly on ventral, but to a greater extent on pectoral, extending on at least basal half of interradial membranes of caudal, the rows anteriorly about parallel with lateral line, becoming oblique under first dorsal, and horizontal under second dorsal, 6 rows between lateral line and first dorsal spine, 24 vertical series on side between origin of anal and base of caudal; dorsal fins close together, the spines moderately slender, the third the longest, 2.0 in head (variable in length according to specimens from Panama), the ninth and tenth very short; second dorsal, somewhat elevated anteriorly; caudal very slightly concave above lateral line, the longest rays below lateral line; anal with convex margin, the spine very weak, adhering closely to first soft ray, its point not free, origin of fin rather nearer vertical from end of dorsal base than base of ventral spine; ventral inserted somewhat less than an eye's diameter behind base of pectoral, 2.0 in head; axillary process of ventral small, bluntly rounded, about half length of eye; pectoral large, reaching at least an eye's diameter beyond tip of ventral, 1.15 in head, 3.6 in length.

Color of old preserved specimen brownish above; lighter below; fins rather darker than body.

The description is based on the specimen reported from Capon, region of Tumbes, by Evermann and Radcliffe (see reference above), which is 260 mm. (218 mm. to base of caudal) long. This example agrees very well with specimens from Panama, with which it was compared. The rather few dorsal spines, numerous anal rays, large pectoral, and rather few scales distinguish this species from the other local forms.

Range.—Mexico to northern Peru.

MENTICIRRHUS PAITENSIS, new species

FIGURE 57

Head 3.35; depth 5.0; D. XI, 24; A. I, 7; P. 21; scales 65.

Body very elongate, somewhat compressed, its greatest thickness fully three-fourths its depth; back little elevated, quite narrow; ventral outline nearly straight; head very low, rather broad, its width and depth about equal over margin of preopercle; caudal peduncle fairly slender, 3.5 in head; snout rather conical, projecting about three-fourths of an eye's diameter beyond premaxillaries, 3.5 in head; eye rather large, 5.5; interorbital 4.25; mouth inferior, horizontal; lower jaw included; maxillary reaching below middle of eye, 2.75 in head; teeth in each jaw in a band, the outer series in upper jaw somewhat enlarged; preopercle with a serrated membranous margin; gill rakers rather thick, none exceeding in length the pupil of eye, 2 somewhat developed on lower and 2 on upper limb of first arch; lateral line only slightly arched anteriorly, becoming horizontal under end of second dorsal; scales moderately small, strongly ctenoid, forming a sheath one scale wide on base of second dorsal, also extending slightly on bases of ventral and pectoral, present on basal two-thirds or so of interradial membranes of caudal, the rows of scales slightly oblique anteriorly, becoming more so under first dorsal, horizontal on caudal peduncle, 5 rows between lateral line and first dorsal spine, 28 vertical series on side between origin of anal and base of caudal; dorsal fins close together, the spines moderately slender, the third with a slight filament, not quite reaching origin of second dorsal if deflexed, 1.9 in head, tenth and eleventh spines very short; second dorsal a little higher anteriorly than posteriorly, its margin nearly straight; upper half of caudal concave, the longest rays in upper lobe and just below lateral line, the lower lobe somewhat damaged, but evidently rounded; anal very small, its longest rays exceeding in length those of second dorsal, the spine slender, adhering to first soft ray only moderately closely, origin of fin a little nearer base of ventral spine than vertical from end of dorsal; ventral inserted rather less than half an eye's diameter behind base of pectoral, 1.7 in head; axillary process of ventral broadly rounded, about half length of eye; pectoral moderately large, reaching well beyond tip of ventral, 1.15 in head, 3.8 in length.

Color grayish brown above, becoming paler with bluish reflections on side; pale with dusky points underneath; first dorsal, anal, ventral, and pectoral quite dark, the pectoral being darkest on inner side; second dorsal and caudal more or less olivaceous, with dusky punctulations at least along margins.

This species is represented by a single specimen, 200 mm. (165 mm. to base of caudal) long (U.S.N.M. No. 128004), taken in a gill net in Paita Bay by the Mission. This species is rather near *M. nasus* (Günther), known from Panama Bay and northward to the Gulf of California, differing in having a slenderer body, smaller scales, apparently in having one more dorsal spine, one fewer anal ray, and in having only one instead of two dorsal spines produced, These and a few other apparent differences are shown in the accompanying parallel comparison, based on the specimen described, and on 4 specimens, 145 to 255 mm. long, of *M. nasus* from Panama Bay.

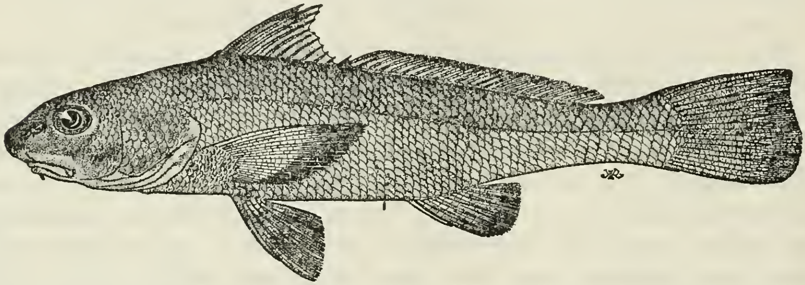

FIGURE 57.—*Menticirrhus paitensis*, new species. From the type, 200 mm. long, Paita Bay, Peru (U.S.N.M. No. 128004).

M. nasus	*M. paitensis*
Body only moderately slender, its depth 3.8 to 4.0 in length; caudal peduncle 2.7 to 3.0 in head.	Body rather slender, its depth 5.0 in length; caudal peduncle 3.5 in head.
Head notably deeper than broad over margin of preopercle.	Head about equal in width and depth over margin of preopercle.
Scales 56 to 58; 25 or 26 vertical series on side between origin of anal and base of caudal.	Scales 65; 28 vertical series on side between origin of anal and base of caudal.
Dorsal rays X–I, 21 to 23.	Dorsal rays XI–I, 24.
Anal rays I, 8.	Anal rays, I, 7.
Second and third dorsal spines produced, reaching far beyond origin of second dorsal if deflexed, 1.05 to 1.25 in head.	Third dorsal spine, only, somewhat produced, not quite reaching origin of second dorsal, 1.9 in head.
Ventral with a pointed axillary process, about as long as eye.	Ventral with a broadly rounded axillary process, about half length of eye.

Range.—Known only from the type specimen from Paita, Peru.

MENTICIRRHUS ROSTRATUS, new species

Figure 58

Head 3.45, 3.5; depth 4.6, 4.3; D. X–I, 23, X–I, 24; A. I, 7, I, 7; P. 18, 19; scales 85, 78.

Body moderately elongate, compressed, its greatest thickness about two-thirds its depth; back rather thin, moderately elevated; ventral outline more or less straight; head long, rather low, compressed, its width less than its depth over margin of preopercle; caudal peduncle rather long, compressed, 3.5, 3.75 in head; snout rather long, blunt, projecting rather less than diameter of pupil beyond premaxillaries, 3.1, 2.75 in head; eye moderately small, 6.3, 7.0; interorbital 4.8, 5.0; mouth inferior, horizontal; lower jaw included; maxillary reaching little beyond anterior margin of pupil, 3.2, 2.9 in head; teeth in each jaw in a broad band, the outer series in upper jaw somewhat separated from the rest and rather notably enlarged; preopercle with a slightly serrated membranous margin; gill rakers very short, 7, 5 slightly developed on lower and 4, 3 on upper limb of first arch; lateral line slightly arched anteriorly, becoming horizontal only on caudal peduncle; scales small, strongly ctenoid, forming a slight sheath one scale wide on base of second dorsal, also extending somewhat on bases of ventral and pectoral, present on at least basal three-fourths of interradial membranes of caudal, the rows above lateral line moderately oblique under spinous dorsal, rather strongly oblique under second dorsal, 6, 5 rows between lateral line and first dorsal spine, and a like number between it and first ray of second dorsal, 36, 37 vertical series on side between origin of anal and base of caudal; dorsal fins close together, the spines slender, the third longest (the second in the paratype), reaching to or a little beyond origin of second dorsal, 1.45, 1.6 in head, the ninth and tenth spines very short; second dorsal highest anteriorly, the longest rays fully as long as snout; upper half of caudal notably concave, the upper lobe acute, lower lobe broadly rounded; anal small, with round margin, the longest rays exceeding those of second dorsal, the spine slender, adhering moderately close

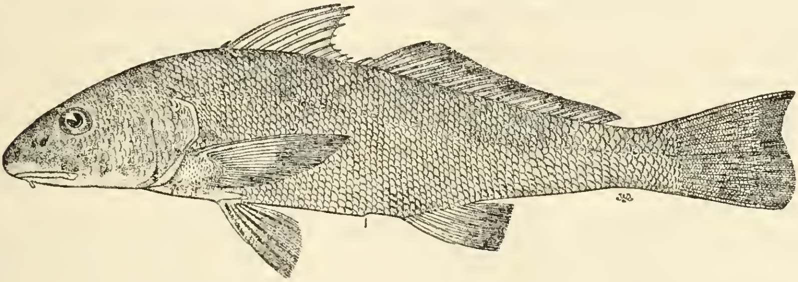

Figure 58.—*Menticirrhus rostratus*, new species. From the type, 330 mm. long, Paita Bay, Peru (U.S.N.M. No. 128002).

to first soft ray, its point not free, origin of fin rather nearer base of ventral spine than vertical from end of second dorsal; ventral inserted about half an eye's diameter behind base of pectoral, quite blunt, 1.8, 1.75 in head; axillary process of ventral pointed, about as long as eye; pectoral large, pointed, extending beyond tip of ventral (especially in paratype), 1.25, 1.15 in head, 4.25, 4.1 in length.

Color grayish brown above; sides silvery gray; lower parts pale, mostly with dusky punctulations; an indefinite dark blotch on lower part of side at tip of pectoral (missing on one side of the paratype); fins all more or less dusky, at least distally, pectoral darkest on inner side.

This species is represented by two specimens, 330 and 445 mm. (275 and 367 mm. to base of caudal) long, both taken by the Mission with a gill net in Paita Bay. The proportions and enumerations given first in each instance apply to the smaller one (U.S.N.M. No. 128002), which was selected as the type. This species is related to *M. undulatus* (Girard), which ranges northward from the Gulf of California to California. The differences noticed when comparing the Peruvian specimens with specimens of *M. undulatus* from California are indicated in the parallel comparison that follows:

M. undulatus	*M. rostratus*
Anal rays I, 8.	Anal rays I, 7.
Scales 87 to 100; rows between lateral line and first dorsal spine 7 or 8, the rows under middle of dorsal fins very strongly oblique.	Scales 78 to 85; rows between lateral line and first dorsal spine 5 or 6, the rows under middle of dorsal fins less strongly oblique.
Ventral 1.45 to 1.6 in head.	Ventral 1.75 to 1.8 in head.
Pectoral reaching tip of ventral in large specimens, shorter in smaller ones, 4.4 to 4.8 in length.	Pectoral reaching beyond tip of ventral, 4.1 to 4.25 in length.
Caudal peduncle 3.0 to 3.1 in head.	Caudal peduncle 3.5 to 3.75 in head.

The name *rostratus* is given in allusion to the long snout.

Range.—Known only from the type and one paratype from Paita Bay, Peru.

Genus UMBRINA Cuvier, 1817

Body moderately elongate; back elevated; head rather low, broad, conical; mouth horizontal, or nearly so, below the projecting snout; a single short, thick barbel at tip of lower jaw; teeth in a band in each jaw, the outer ones in upper jaw somewhat enlarged; margin of preopercle finely serrate; first dorsal with 10 rather slender spines; second dorsal long, with about 25 to 30 soft rays; anal small, with 2 spines, and with about 5 to 8 soft rays.

A single species is represented in the collections from Peru now at hand.

UMBRINA XANTI Gill

POLLA

Umbrina xanti GILL, 1862, p. 257, Cape San Lucas, Baja California (original description).—EVERMANN and RADCLIFFE, 1917, p. 105, Tumbes, Peru (synonymy; description, based on a specimen 280 mm. long).—MEEK and HILDEBRAND, 1925, p. 615, Panama Bay (synonymy; description; range).

Head 3.6 to 4.0; depth 3.2 to 3.4; D. X–I, 27 to 30; A. II, 6 (rarely 5); P. 17 or 18; scales 63 to 70.

Body oblong, well compressed, its greatest thickness somewhat less than half its depth; back rather strongly elevated; dorsal profile anteriorly notably convex; head fairly small; caudal peduncle short, rather strongly compressed, 2.5 to 3.1 in head; snout conical, projecting beyond mouth, 3.0 to 3.5; eye 3.7 to 5.8; interorbital 3.6 to 4.8; mouth horizontal; lower jaw included, with a short thick barbel at its tip; maxillary extending nearly or quite to vertical from posterior margin of pupil, 2.8 to 3.1 in head; teeth in a band in each jaw, the outer ones in upper jaw somewhat enlarged; margin of preopercle finely serrate; gill rakers short, better developed in small specimens than in large ones, 7 to 11 more or less developed on lower and 5 to 7 on upper limb of first arch; lateral line slightly arched anteriorly, then decurved, reaching middle of side over end of anal base; scales strongly ctenoid, rows irregular, those above lateral line strongly oblique, becoming parallel with lateral line on caudal peduncle only, 5 or 6 rows between lateral line and base of first dorsal spine, extending more or less on all the fins, exclusive of spinous dorsal and anal; dorsal fins contiguous in small specimens, rather well separated in large ones, the spines slender, the second and more usually the third longest, 1.6 to 1.75 in head, anterior rays of second dorsal longest, margin of fin slightly convex; caudal emarginate, the upper lobe acute, the lower one rounded; anal very small, the second spine fairly strong, proportionately shorter in adult, 2.2 to 3.1 in head; ventral moderate, 1.3 to 1.5 in head; pectoral short, not reaching tip of ventral, fourth and fifth rays longest, 1.4 to 1.6 in head, 5.6 to 6.0 in length.

Color silvery, with conspicuous dark stripes along the rows of scales on back and sides; inside lining of gill covers black, apparently showing through the opercle, as a dark blotch; fins plain, the dorsal fins, caudal, and pectoral slightly dusky.

This species is represented in the collection furnished by the Mission by 11 specimens, 10 small ones, 95 to 155 mm. (76 to 128 mm. to base of caudal) long, and 1 large one, 465 mm. (390 mm. to base caudal) long, all from Lobos de Tierra Island and Bay. In addition there is at hand a specimen, 75 mm. (62 mm. to base of caudal) long, taken off Paita by W. L. Schmitt; also a specimen reported by Evermann and Radcliffe (see reference above), 280 mm. (235 mm. to base of caudal) long, from Tumbes. The local name "polla" is given in the work by

Evermann and Radcliffe, already referred to, presumably having been supplied by R. E. Coker, who is quoted by the same authors as saying of this fish, "Vocal powers well developed." Polla does not appear in the list of commercial species for which statistical data are offered in the report of the Mission (1943). It would seem, then, that it is of little if any commercial importance. The Peruvian examples seem to be identical with specimens from Panama Bay, with which they were compared.

Range.—Known from Baja California to northern Peru.

Genus PARALONCHURUS Bocourt, 1869

Body elongate; back rather narrow; head rather low, broad, blunt; a row of slender barbels on inner edge of dentary bones, becoming more crowded anteriorly, and forming a tuft at the chin; preopercle with a ciliated membranous margin; mouth inferior, generally not quite horizontal; teeth in the jaws small, in bands, the outer ones sometimes more or less enlarged; gill rakers little developed, only about 5 to 10 on lower limb of first arch; first dorsal composed of about 9 to 11 slender spines; second dorsal long and low, with about 24 to 36 soft rays; anal small, with 2 rather small spines, and about 7 to 9 soft rays.

Three species are included in the Peruvian collections studied. As the series of scales are rather irregular, the enumerations given are only approximately correct. The species herein discussed have been placed in the genus *Polyclemus* Berg by some authors, who reserved *Paralonchurus* for the Central American species *petersi*, which differs in having larger pectoral fins; rather prominently enlarged outer teeth in upper jaw; more or less definitely cycloid scales above lateral line, which are ctenoid in the other species; and in having more numerous rays (33 to 36) in the second dorsal. As these differences are mostly a matter of degree, and as no useful purpose seems to be accomplished by dividing this rather small group, I shall recognize only one genus.

KEY TO THE SPECIES

a. Anal with 8 or 9 rays; first arch with 11 to 14 gill rakers on lower limb, and 7 to 9 on the upper one; second dorsal with a narrow sheath of scales at base, the rest of fin naked; pectorals shorter than head, 4.1 to 4.3 in length-- **peruanus** (p. 269)

aa. Anal with 7 rays; first arch with 6 to 8 gill rakers on lower limb, and 3 or 4 on the upper one; second dorsal almost completely covered with scales.

b. Second dorsal with 24 rays; about 58 scales in a lateral series; pectoral shorter than head, 5.1 to 5.25 in length; eye large, 4.75 to 5.0 in head. **dumerilii** (p. 270)

bb. Second dorsal with 27 or 28 rays; 66 to 73 scales in a lateral series; pectoral about as long as head, 3.75 to 4.2 in length; eye very small, 5.6 to 6.8 in head-- **goodei** (p. 271)

PARALONCHURUS PERUANUS (Steindachner)

Coco; Suco

Genyanemus peruanus STEINDACHNER, 1875a, p. 29, Paita and Callao, Peru (original description; generic relationship discussed).

Polycirrhus peruanus JORDAN and EIGENMANN, 1889, p. 415, Callao and Paita, Peru (diagnosis, based on part of Steindachner's type material).

Polyclemus |*peruanus* STARKS, 1906, p. 796, Callao, Peru (description).—EVERMANN and RADCLIFFE, 1917, p. 108, Callao, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 510, Callao, Peru.

Head 3.3 to 3.6; depth 3.25 to 3.5; D. IX or X–I, 25 or 26; A. II, 8 or 9; P. 17 to 19; scales 61 to 64; vertebrae 27 (one specimen dissected).

Body elongate, compressed, more or less V-shaped anteriorly in cross section, the back being very thin, greatest thickness of body nearly two-thirds its depth; profile nearly straight to nape, convex from there to origin of dorsal; head rather low, broad; caudal peduncle moderately long, slender, compressed, 3.0 to 3.4 in head; snout very blunt, vertical anteriorly, scarcely projecting beyond premaxillaries, 3.5 to 3.9 in head; eye rather small, 5.75 to 6.4; interorbital broad, convex, 2.7 to 2.9; mouth slightly oblique; lower jaw included; maxillary reaching about to posterior margin of pupil, 2.8 to 3.1 in head; teeth in each jaw small, pointed, in a broad band, the outer ones of upper jaw slightly enlarged, band on lower jaw interrupted anteriorly on median line; preopercle with a rather finely ciliate membranous margin; gill rakers slender, only about half as long as pupil, 11 to 14 more or less developed on lower and 7 to 9 on upper limb of first arch; lateral line somewhat arched anteriorly, becoming horizontal above base of anal; scales strongly ctenoid, 7 oblique rows between lateral line and first dorsal spine, a narrow sheath of scales, composed mostly of one series of scales on base of second dorsal, no scales on rest of fin (contrary to statement in original description), extending on caudal nearly to tip, none on anal, but present on base of ventral and pectoral; dorsal fins close together, more or less connected by a membrane in the smaller specimens, the spines very slender, the third or fourth longest, 1.9 to 2.5 in head; second dorsal long, of about uniform height throughout, the rays notably shorter than the longest spines; upper half of margin of caudal concave, the rays of the upper acute lobe and the middle rays longest and of about equal length, the lower lobe shorter and broadly rounded, the margin apparently tending to become straighter with age; anal moderate, with a nearly straight margin, the spines rather weak, the first a mere point, the second adhering closely to the soft ray, 3.1 to 3.9 in head; ventral inserted immediately behind base of pectoral, reaching (without filament) fully halfway to anal, 1.6 to 1.75 in head; pectoral moderately long, fairly pointed, the fourth and fifth rays longest, reaching to or beyond tip of ventral 1.2 to 1.25 in head, 4.1 to 4.3 in length.

Color grayish to brownish, with or without dark cross bars; lower parts pale or silvery; one specimen with eight cross bars, the anterior ones quite distinct, the posterior ones obscure, another specimen without bars, the first one being perhaps represented by a dark shoulder spot, other specimens intermediate as to the development of cross bars; fins all more or less dusky, generally darker toward distal margins, inner side of pectoral quite dark. The differences in color apparently are quite unrelated to age, as the smallest and largest specimens at hand are plainest.

This species is represented in the collections studied by five specimens, 210 to 380 mm. (204 to 310 mm. to base of caudal) long, upon which the description is based. The largest specimen was secured by R. E. Coker, at Callao. The others were collected by the Mission with an otter trawl, one in Sechura Bay, near Sechura, one in Paita Bay, and two at the Isla Santa, near Chimbote. These specimens seem to agree with the original description in all respects, except that the second dorsal and anal are not covered with scales. As the rest of the description is quite accurate for the specimens herein described, this one point perhaps may be passed over as a mistaken observation.

It is indicated in the report of the Mission (1943, p. 276) that this species is of considerable commercial importance in northern Peru. No catch for the other species of the genus is mentioned. As they quite certainly are not separated for the market, it may be assumed that the catch reported was composed of all the local species of the genus.

Range.—Known only from the coast of Peru.

PARALONCHURUS DUMERILII (Bocourt)

Polycirrhus dumerilii Bocourt, 1869, p. 22, La Unión, El Salvador (original description).

Paralonchurus dumerilii Meek and Hildebrand, 1925, p. 672, Panama Bay (synonymy; description; range).

Head 3.6, 3.7; depth 3.6, 3.7; D. IX–I, 24, IX–I, 24; A. II, 7, II, 7; P. 17, 19; scales 58, 58.

Body elongate compressed, more or less V-shaped anteriorly in cross section, the back being very thin, greatest thickness of body about two-thirds its depth; profile convex over snout and at nape, nearly straight over eyes; head low, broad; caudal peduncle rather long, compressed, 2.9, 2.9 in head; snout somewhat conical, projecting beyond premaxillaries, 3.5, 3.75 in head; eye large, 5.0, 4.75; interorbital moderately broad, convex, 3.1, 3.0; mouth only slightly oblique; lower jaw included; maxillary reaching nearly to posterior margin of pupil, 3.1, 2.9 in head; teeth in a band in each jaw, interrupted anteriorly in lower jaw, the outer teeth in upper jaw not perceptibly enlarged; preopercle with a finely ciliated membranous margin; gill rakers very small, mere points, 8, 7 more or less developed on lower and 4, 3 on upper limb of first arch; lateral line with a long, low arch anteriorly, becoming horizontal over base of anal; scales very strongly ctenoid, 5, 6 oblique rows between lateral line and first dorsal spine, covering second dorsal, caudal, and anal almost completely, present also on basal half or so of ventral and pectoral; dorsal fins close together, the spines very slender, the third or fourth longest, 2.1, 1.75 in head; second dorsal highest posteriorly, the rays much shorter than the longest spines; middle rays of caudal longest, the upper half of fin slightly concave, the lobe somewhat acute, lower half broadly convex; anal small, with convex margin, the spines rather slender, the second adhering moderately closely to the first ray, 3.6, 3.6 in head; ventral inserted immediately behind base of pectoral, reaching (without filament) about halfway to anal, 1.6, 1.5 in head; pectoral short, rather broadly pointed, the fifth and sixth rays longest, failing to reach tip of ventral, 1.4, 1.4 in head, 5.1, 5.25 in length,

Color silvery gray above; pale silvery below; side with five distinct dark bars, the first above and behind base of pectoral, the second about under middle of first dorsal, the third a little in advance of origin of second dorsal, the other two under base of second dorsal; an obscure bar at nape extending down to margin of preopercle; obscure dark lines along the rows of scales on upper part of body; first dorsal and ventral dusky at least distally; other fins rather pale.

The description is based on two specimens, 360 and 310 mm. (300 and 253 mm to base of caudal) long, furnished by the Mission which were taken with an otter trawl in the Gulf of Guayaquil, off Puerto Pizarro. The proportions and enumerations given first in each instance pertain to the larger specimen. There is at hand, also, a specimen, 325 mm. long (U.S.N.M. No. 88746) taken at Guayaquil, Ecuador, by W. L. Schmitt. These specimens are identical with others from Panama Bay, with which they were compared. This species is distinguishable from the others herein described by the shorter pectoral fin, the densely scaled second dorsal and anal, and the large eye.

Range.—El Salvador to northern Peru. Previously not reported from Peru.

PARALONCHURUS GOODEI Gilbert

MIMIS

Paralonchurus goodei GILBERT, *in* Jordan and Evermann, 1898, p. 1480, Panama Bay (original description; compared with *P. petersi*).—MEEK and HILDEBRAND, 1925, p. 673, Panama Bay (synonymy; description; range).

Head 4.0 to 4.25; depth 4.0 to 4.5; D. X or XI–I, 27 or 28; A. II, 7; P. 19 to 21; scales 66 to 73; vertebrae 23 or 24 (2 specimens dissected).

Body rather slender, more or less V-shaped anteriorly in cross section, the back being very thin, greatest thickness of body about two-thirds its depth; profile convex over snout, nearly straight over orbits, convex at nape; head low and broad; caudal peduncle short, compressed, 2.6 to 2.7 in head; snout somewhat conical, projecting well beyond premaxillaries, 3.4 to 3.75; eye very small, 5.6 to 6.8; interorbital convex, 3.25 to 3.5; mouth nearly horizontal; lower jaw included; maxillary reaching fully to vertical from posterior margin of pupil, 3.0 to 3.2 in head; teeth in a band in each jaw, the one in lower jaw interrupted anteriorly, none of the teeth perceptibly enlarged; preopercle with a ciliated membranous margin; gill rakers moderately stocky, those at angle about as long as pupil, six or seven more or less developed on lower and four on upper limb of first arch; lateral line slightly arched anteriorly, becoming horizontal just posterior to base of anal; scales small, strongly ctenoid, five or six oblique rows between lateral line and first dorsal spine, covering second dorsal and caudal almost completely, missing on anal, present on bases of ventral and pectoral; dorsal fins more or less connected by membrane, the spines low and very slender, the third or fourth longest, 1.6 to 2.1 in head; second dorsal long and rather low, highest posteriorly, the longest rays about equal in length to the longest spines; caudal obtusely pointed, the longest rays being just below the middle of fin, the margin above longest rays oblique and very slightly convex, broadly convex below the longest rays; anal small, the spines weak, the second 3.0 to 3.4 in head; ventral inserted immediately behind base of pectoral, reaching (without filament) about halfway to anal in the smaller specimens, somewhat shorter in larger ones, 1.3 to 1.4 in head; pectoral rather long, reaching somewhat beyond tip of ventral (without filament), the fourth and fifth rays longest, about as long as head, 3.75 to 4.2 in length.

Color grayish brown, with metallic reflections; pale gray to silvery below; a few of the specimens with obscure dark bars; dark lines along the rows of scales; dorsal and caudal fins olive, tending to become dusky toward the margins in some specimens; anal and ventral rather pale, the interradial membranes sometimes dusky, the spine and outer ray of ventral with its filament white; pectoral very dark, except at base, its upper margin conspicuously white.

The description is based on the five specimens, 190 to 275 mm. (150 to 220 mm. to base of caudal) long, contained in the collection furnished by the Mission, all of which were taken with an otter trawl in the Gulf of Guayaquil, off Puerto Pizarro. The specimens agree with a "cotype" from Panama Bay, with which they were compared. This species may be distinguished from the others herein described by the very small eye, the long, dark pectoral with a conspicuously white upper margin, the densely scaled second dorsal, naked anal, and small scales.

Range.—Panama Bay to northern Peru. Heretofore known only from Panama Bay.

Genus CYNOSCION Gill, 1861

Body rather elongate, somewhat compressed; back little elevated; head rather low, more or less pointed; mouth large, oblique; lower jaw protruding; teeth pointed, in a narrow band or in more or less definite rows, upper jaw anteriorly with a pair of large recurved canines; preopercle serrate in young, and with spines on its anterior ridge, becoming obsolete or covered with skin in large examples; dorsal with about 7 to 11 slender spines; second dorsal long and low, with about 20 to 30 rays; anal small, its base generally less than half the length of that of second dorsal, with 2 weak spines, often more or less hidden in the skin, and about 8 to 20 soft rays.

KEY TO THE SPECIES

a. Anal fin long, with 15 to 19 soft rays.
- *b.* Anal with 15 soft rays, its base 2.0 to 2.4 in head; caudal fin nearly straight (in young) to concave (in adult)---------------------- **analis** (p. 273)
- *bb.* Anal with 17 to 19 soft rays, its base 1.3 to 1.5 in head; caudal fin rounded (in young) to double concave (in adult), the middle rays always longest. **altipinnis** (p. 275)

aa. Anal fin short, with fewer than 12 rays.
- *c.* Second dorsal and anal densely covered with small scales, the fins more or less thickened by them; lateral line broadly arched anteriorly; pectoral moderately long, reaching about to tip of ventral, 1.5 in head; scales rather large, strongly ctenoid, about 87 in a lateral series above lateral line-- **squamipinnis** (p. 277)
- *cc.* Second dorsal and anal not densely covered with scales, few if any present; lateral line not arched; pectoral short, not nearly reaching tip of ventral, about 1.8 to 2.1 in head.
  - *d.* Scales moderately large, ctenoid, about 72 to 86 in a lateral series above lateral line, and 8 scales between lateral line and middle of second dorsal; lateral line decurved, reaching middle of side under origin of second dorsal; dorsal spines short, the longest one scarcely longer than the longest soft rays of second dorsal, and failing to reach tips of succeeding spines, if deflexed----------------- **stolzmanni** (p. 278)
  - *dd.* Scales quite small, cycloid, about 105 in a lateral series above lateral line, about 12 or 13 between lateral line and middle of second dorsal; lateral line nearly straight anteriorly, descending to middle of side under anterior half of second dorsal; dorsal spines rather long, the longest one notably longer than the longest soft rays of second dorsal and reaching beyond tips of succeeding spines if deflexed. **phoxocephalus** (p. 279)

CYNOSCION ANALIS (Jenyns)

ROBALITO; ALLANQUE; AYANQUE

Otolithus analis JENYNS, 1842, p. 164, Callao, Peru (original description).
Otolithus peruanus TSCHUDI, 1845, p. 10, coast of Peru (original description).
Archoscion analis ABBOTT, 1899, p. 352, Callao, Peru (description, based on 3 large specimens).—STARKS, 1906, p. 793, Callao, Peru.
Cynoscion analis NICHOLS and MURPHY, 1922, p. 509, Callao market, Peru

Head 2.9 to 3.2; depth 3.7 to 4.2; D. IX (occasionally X)–I, 23 (occasionally I, 22); A. II, 15; P. 17 or 18; scales about 85 to 100 (often difficult to enumerate).

Body quite elongate, moderately compressed, its greatest thickness about two-thirds its depth; back little elevated; dorsal profile anteriorly very gently convex, less convex than ventral profile; head low, compressed; caudal peduncle rather long, compressed, 3.6 to 4.0 in head; snout pointed, 3.75 to 4.0; eye 5.0 to 6.7; interorbital 4.1 to 4.9; mouth large, oblique; lower jaw projecting strongly; maxillary extending to or a little beyond posterior margin of pupil, 2.2 to 2.3 in head; teeth in a narrow band in each jaw, upper jaw with a pair of large canines (one often missing), and generally with a smaller canine on each side of the large ones, lateral teeth in lower jaw enlarged, pointed; membranous margin of preopercle crenulate; gill rakers slender, those at angle about two-thirds length of eye, 9 to 11 on lower and 3 to 6 on upper limb of first arch; lateral line nearly straight anteriorly, then decurved, reaching middle of side under anterior part of second dorsal; scales small, thin, the rows above lateral line running obliquely upward, small scales densely covering soft dorsal and anal, also extending on the other fins; dorsal fins well separated, proportionately farther apart in large specimens than in small ones, distance between base of last dorsal spine and origin of second dorsal fully equal to diameter of eye in the larger specimen, spines of first dorsal slender, more or less flexible, the third one generally longest, notably longer than the longest soft rays, 2.1 to 2.5 in head; second dorsal highest anteriorly; caudal with a nearly straight margin in the smallest specimens at hand, decidedly concave with acute lobes in the largest ones; anal similar to second dorsal though much shorter, the spines very weak, its origin a little in advance of middle of base of second dorsal, its base 2.0 to 2.4 in head; ventral inserted scarcely behind base of pectoral, pointed, 2.0 to 2.2 in head; pectoral long, especially in large specimens, pointed, the fifth or sixth ray (counting downward) longest, 1.3 to 1.5 in head, 4.0 to 4.5 in length.

Color metallic blue to brown above; silvery on side; pale silvery below; faint dark lines along the rows of scales on side and back; tip of mandible quite dark; color pattern under magnification broken up into dusky punctulations of varying density; fins in general lighter than adjacent parts of body, also, exclusive of the ventrals, with dusky punctulations, margin of dorsal fins blackish; axil of pectoral black.

This species is represented by 15 specimens, 155 to 375 mm. (128 to 312 mm. to base of caudal) long, in the collection made by the Mission. The specimens were caught with trammel nets, gill nets, seines, and with handlines in the Gulf of Guayaquil, off Puerto Pizarro; at Lobos de Tierra Island, and in Lobos de Tierra Bay; at Isla Santa, near Chimbote; at San Lorenzo Island; at Pachacamac Island; and off La Punta, Callao.

The relationship of *C. analis* and *C. altipinnis* has not been understood. It is now set forth rather concretely in the parallel comparison given in the account of *C. altipinnis*.

Although seemingly rather common on the coast of Peru, this species, or genus, is not listed among the commercial fishes in the report of the Mission (1943). It apparently was not distinguished from *Sciaena*, which is listed under the local name "ayanque," a name also applied to *Cynoscion* in the field notes.

Range.— Northern Peru.

CYNOSCION ALTIPINNIS (Steindachner)

Ancylodon altipinnis Steindachner, 1866, p. 2, pl. 1, fig. 3, "West coast of South America" (original description).

Archoscion altipinnis Abbott, 1899, p. 353 (no specimens reported; relationship with *analis* discussed; "Habitat.—Peru, perhaps extending southward").

Head 3.0 to 3.4; depth 3.5 to 4.1; D. VII to IX, 22 or 23; A. II, 17 to 19; P. 17 or 18; scales about 90 to 100.

Body moderately compressed, its greatest thickness rather more than half its depth; back little elevated; profile slightly concave over eyes; head compressed; caudal peduncle fairly long, compressed 3.2 to 3.7 in head; snout pointed, 4.1 to 4.9; eye 3.5 to 4.4; interorbital 4.8 to 5.3; mouth large, oblique; lower jaw projecting; maxillary reaching to or beyond posterior margin of pupil, 1.9 to 2.15 in head; teeth in a narrow band in each jaw, upper jaw anteriorly with a pair of large canines (one often missing) and with a few smaller ones at sides, the lateral teeth in lower jaw enlarged, pointed; membranous margin of preopercle crenulate in the larger examples, with serrae at and below angle in young (under about 150 mm. in length), anterior ridge of preopercle with 3 rather strong spines, externally quite evident in young, becoming hidden in large examples; gill rakers slender, those at angle slightly exceeding half length of eye, 8 to 10 on lower and 3 or 4 on upper limb of first arch; lateral line decurved, reaching middle of body about under origin of second dorsal; scales very small, thin, the rows above lateral line very oblique, small scales densely covering soft dorsal and anal, also extending on the other fins; dorsal fins far apart, the interspace exceeding diameter of eye, in the larger examples, close together in young, with 1 or 2 extra spines, these hidden in the skin in a specimen 145 mm. long, not discernible in specimens 190 mm. and more in length, the spines slender, the third usually longest, scarcely longer than the longest soft rays, 2.1 to 2.9 in head; caudal fin apparently more or less round (somewhat damaged) in young, slightly double concave, the middle rays longest in adult; anal similar to soft dorsal, though shorter, the spines very weak, its origin under beginning of about second fourth of soft dorsal, its base 1.3 to 1.5 in head; ventral inserted slightly behind base of pectoral, 1.7 in head;

pectoral moderate, reaching somewhat beyond tip of ventral, the fifth or sixth ray (counting downward) longest, 1.2 to 1.4 in head, 4.1 to 4.5 in length.

Color grayish brown, with metallic reflection above; silvery below; an indefinite dark area on upper part of opercle; most of body with dusky punctulations, these extending on all the fins, exclusive of the ventrals; axil of pectoral dusky.

This species is represented in the collection, furnished by the Mission, by six specimens, 85 to 235 mm. (66 to 191 mm. to base of caudal) long, taken with an otter trawl in the Gulf of Guayaquil off Puerto Pizarro. These specimens have been identified as *C. altipinnis*, originally described from the "Westküste von Südamerika" by Steindachner. The name *altipinnis* has been placed in the synonymy of *C. analis* by several authors. However, there certainly are two species with long anal fins in the Peruvian collections. The number of anal rays, given as II, 17 in Steindachner's original description, offers the chief reason for recognizing *C. altipinnis* as valid and indentifying with it the six specimens herein described. Other differences are shown in the parallel comparisons offered. Steindachner's figure (head only) of the type, which was 7 inches (175 mm.) long, shows spines on the anterior ridge of the preopercle. These are evident on the smaller specimens of both species, and although not visible in the larger specimens, they remain, but are hidden in the skin. The presence of these spines, therefore, does not constitute a distinguishing character, as Abbott (1899, p. 353) believed. The characters distinguishing the two species are tabulated below:

C. analis	*C. altipinnis*
Soft rays of anal, uniformly 15 in 13 specimens.	Soft rays of anal, 17 in 2 specimens, 18 in 3, and 19 in 1.
Dorsal spines in adults, 9 in 13 specimens, 10 in 1.	Dorsal spines in adults 7 in 2 specimens, 8 in 2; in young 9 in 1 and 10 in 1 (the last 2 spines apparently disappearing with age).
Soft rays of dorsal, 22 in 1 specimen, 23 in 12.	Soft rays of dorsal, 22 in 4 specimens, 23 in 2.
Base of anal 13 to 18 percent of length; origin of anal slightly anterior to middle of base of soft dorsal.	Base of anal 20 to 25 percent of length; origin of anal nearly under beginning of second fourth of soft dorsal.
Caudal fin with concave margin, the middle rays shortest in adult; fin nearly square in small specimens.	Caudal fin more or less double concave, the middle rays longest in adult; fin apparently rounded in young.

Range.—Originally recorded from "West coast of South America," now for the first time definitely recorded from northern Peru. Probably not numerous.

CYNOSCION SQUAMIPINNIS (Günther)

Otolithus squamipinnis GÜNTHER, 1869, p. 429, Panama Bay (original description).
Cynoscion squamipinnis MEEK and HILDEBRAND, 1925, p. 656, Panama Bay (synonymy; description; range).

Head 3.3; depth 4.1; D. VIII–I, 22; A. II, 10; P. 18; scales 87.

Body moderately elongate, its greatest thickness rather more than half its depth; dorsal outline scarcely convex from nostrils to nape; head long, rather low, compressed; caudal peduncle rather long, moderately compressed, 3.7 in head; snout pointed, 3.8; eye 6.3; interorbital 4.25; mouth very large, oblique; lower jaw projecting; maxillary extending fully to posterior margin of eye, 2.0 in head; teeth largely in two irregular series, in a band anteriorly in lower jaw, upper jaw with a pair of large, curved canines, some of the lateral teeth in each jaw enlarged, those in lower jaw larger than those in upper jaw; membranous margin of preopercle crenulate; opercle with two flat spines; gill rakers slender, those at angle about two-thirds length of eye, nine more or less developed on lower and three on upper limb of of first arch; lateral line somewhat arched anteriorly, descending to middle of side under anterior half of second dorsal; scales moderate, ctenoid, extending on all the fins, densely covering soft dorsal and anal, about nine scales between lateral line and base of first dorsal spine, and about eight between it and middle of second dorsal; dorsal fins separated by a distance scarcely exceeding pupil of eye, the spines of first dorsal slender, the third the longest, not reaching beyond the tip of any of the succeeding spines if deflexed, scarcely longer than longest soft rays, 2.3 in head; caudal fin somewhat rounded, the middle rays being longest; anal with round margin, its origin about under middle of soft dorsal, its base 2.5 in head, ventral inserted just behind base of pectoral, 1.75 in head; pectoral moderate, pointed, reaching opposite tip of ventral, the fifth ray (counting downward) the longest, 1.5 in head, 5.0 in length.

Color grayish brown above; silvery below; inside lining of opercle largely black; membrane of subopercle with dusky punctulations; dorsal fins and caudal dusky; axil of pectoral dark.

This species is represented among the Peruvian material by a single specimen, 350 mm. (292 mm. to base of caudal) long, taken by the Mission in the Gulf of Guayaquil, off Puerto Pizarro. It is apparently rather rare, being known only from a few specimens taken at La Unión, El Salvador, and some others from Panama Bay. The specimen from Peru was compared with a somewhat larger one from Panama, with which it in general agrees. It was noticed, however, that the pectoral fins are less densely scaled in the Peruvian fish, and the ventral fine are inserted immediately behind the bases of the pectorals, whereas they are inserted under the bases of the pectorals in the Panama specimen. Furthermore, in the Panama specimen the maxillary extends well beyond the posterior margin of the eye, instead of extending below the posterior margin as in the Peruvian specimen.

The large mouth, the densely scaled dorsal and anal, and the rounded caudal distinguish this species from other Peruvian forms.

Range.—El Salvador to northern Peru.

CYNOSCION STOLZMANNI (Steindachner)

Otolithus stolzmanni Steindachner, 1879b, p. 35, pl. 2, fig. 1, Tumbes, Peru (original description; compared with *O. albus* Günther).

Cynoscion stolzmanni Meek and Hildebrand, 1925, p. 663, Panama Bay (synonymy; description; range).—Tortonese, 1939b, p. 304, Callao, Peru.

Head 3.5 to 4.0; depth 4.0 to 5.3; D. IX or X–I, 19 to 21; A. II, 9; P. 18; scales 72 to 86.

Body quite elongate, its greatest thickness somewhat greater than half its depth; dorsal outline anterior to nape scarcely convex; head rather low, compressed; caudal peduncle long, rather strongly compressed, 3.1 in head; snout pointed 3.3 to 4.4; eye 5.2 to 7.6; interorbital 5.6; mouth large, oblique; lower jaw strongly projecting; maxillary reaching nearly or quite to posterior margin of eye, 2.0 to 2.3 in head; teeth in jaws anteriorly in three principal series, in two series laterally, upper jaw anteriorly, with a pair of large, recurved canines, the lateral teeth of the outer series in upper jaw somewhat enlarged, and the inner series of lateral teeth in lower jaw enlarged; membranous margin of preopercle crenulate; opercle with two flat spines; gill rakers slender, those at angle about two-thirds length of eye, seven or eight more or less developed on lower and two or three on upper limb of first arch; lateral line decurved, reaching middle of side under origin of second dorsal; scales moderately small, ctenoid (apparently less strongly ctenoid in large examples than in smaller ones), forming a narrow sheath on about one scale at base of second dorsal and anal, few if any extending on these fins, extending on base of caudal and to a lesser extent on base of ventral and pectoral, about nine scales between lateral line and base of first dorsal spine, and eight between it and middle of second dorsal; dorsal fins close together, the spines of the first slender, the fourth the longest, not reaching past the tips of the succeeding ones if deflexed, scarcely longer than the longest soft ray, 1.7 to 2.1 in head; caudal fin somewhat rounded in small examples (about 400 mm. long), almost straight (square) in large examples; anal with concave margin, its origin a little behind middle of second dorsal, its base about 2.8 in head; ventral inserted well behind base on pectoral, quite large, much longer than pectoral, 1.6 in head; pectoral small, short, not nearly reaching tip of ventral, 1.8 to 2.1 in head, 6.8 to 7.1 in length.

Color of a large specimen taken at Balboa, Canal Zone, iridescent blue above, silvery below; first dorsal and pectoral almost colorless; second dorsal and ventral lemon yellow; caudal largely orange; axil of pectoral dusky.

This species, although originally described from the Gulf of Guayaquil at Tumbes, has not been taken there by recent collectors. It has been described here from specimens from Panama Bay, 230 to 685 mm. (190 to 587 mm. to base of caudal) long, the proportions and enumerations mostly being based on 12 specimens. This is the "white corbina" of Panama Bay, where it is an important and highly prized food and game fish.

Range.—Panama Bay to Callao, Peru.

CYNOSCION PHOXOCEPHALUS Jordan and Gilbert

Cynoscion phoxocephalus Jordan and Gilbert, 1882c, p. 318, Panama Bay (original description).—Evermann and Radcliffe, 1917, p. 97, Tumbes, Peru (description, based on a specimen 295 mm. long).—Meek and Hildebrand, 1925, p. 660, Panama Bay (synonymy; description; range).

Head 3.1; depth 4.3; D. X–1, 20; A. II, 10; P. 17; scales about 105.

Body quite elongate, its greatest thickness about two-thirds its depth; dorsal outline nearly straight from nostrils to nape; head long, low, compressed; caudal peduncle fairly slender, 4.1; snout pointed, 3.8 in head; eye 6.3; interorbital 4.4; mouth large, oblique; lower jaw projecting very strongly; maxillary not quite reaching posterior margin of eye, 2.2 in head; teeth largely in 2 series anteriorly, reduced to one series posteriorly, in each jaw, upper jaw anteriorly with a pair of moderately large, curved canines, the outer lateral teeth in lower jaw slightly enlarged, pointed; membranous margin of preopercle slightly crenulate; opercle with two flat spines; gill rakers slender, those at angle about half length of eye, seven on lower and three on upper limb of first arch; lateral line straight anteriorly, descending to middle of side under anterior part of soft dorsal; scales very small, cycloid, extending on the vertical fins, but not covering them completely, about 15 scales between lateral line and base of first dorsal spine, and about 12 or 13 between it and middle of second dorsal; dorsal fins close together, spines slender, the last one of first fin separate, the third longest, reaching beyond the succeeding 4 spines if deflexed, much longer than the longest soft ray, 1.9 in head; caudal fin damaged, emarginate in Panama specimen of about the same size as the Peruvian specimen here described; anal with round margin, its origin about under middle of soft dorsal, its base 2.4 in head; ventral inserted just behind base of pectoral, 2.0 in head; pectoral small, short, rounded, 1.95 in head, 6.25 in length.

Color brownish above; silvery below; opercle with an indefinite dark blotch; inside lining of opercle largely black; axil of pectoral dark; spinous dorsal dusky distally; fins otherwise plain.

This species is represented by a single specimen, 295 mm. (250 mm. to base of caudal) long, in the Peruvian collections studied. It was taken near Tumbes by R. E. Coker. The specimen was compared with others from Panama, including a paratype with which it agrees well, except for the modified (enlarged) scales in the lateral line, which the Panama specimens do not have to the same degree.

Range.—Panama Bay to northern Peru. Probably rare in Peru.

Genus ODONTOSCION Gill, 1862

Body elongate, compressed; head rather low, more or less compressed; snout conical; tip of lower jaw with a slight knob, but no barbel; mouth fairly large, moderately oblique; teeth in jaws in 1 or 2 series, some of the teeth enlarged, caninelike, a pair of canines at tip of lower jaw; gill rakers slender, about 14 to 17 on lower limb of first arch; margin of preopercle with at least a few weak spines[17]; first dorsal with 10 to 13 spines; second dorsal with about 23 to 27 soft rays; anal small, with 8 or 9 soft rays, the second spine not greatly enlarged.

A single, heretofore undescribed species is included in the Peruvian collections now at hand.

ODONTOSCION AUSTRALIS, new species

FIGURE 59

Head 3.0 to 3.1; depth 3.4 to 3.75; D. X–I, 25 or 26; A. II, 8; P. 15 or 16; scales 56 to 59; vertebrae 25 (one specimen dissected).

Body elongate, compressed, its greatest thickness about half its depth; back not greatly elevated; profile gently convex at nape, nearly straight over eyes; head well compressed; caudal peduncle moderately slender, 2.9 to 3.1 in head; snout more or less conical, 3.4 to 4.2; eye 3.8 to 4.4; interorbital 4.1 to 4.8; mouth large, oblique, terminal; maxillary extending beyond vertical from posterior margin of pupil, 2.0 to 2.15 in head; teeth in upper jaw in 2 series, those of the outer series enlarged, caninelike, those of the inner series very small, lower jaw with a single series, irregularly large or small, with a pair of canines at tip; preopercle with a somewhat enlarged spine at angle and smaller ones above it, and with a prominent preopercular ridge; gill rakers slender, those at angle about two-thirds length of eye, 14 to 16 on lower and 7 on upper limb of first arch; lateral line scarcely arched anteriorly, attaining middle of side over or somewhat in advance of origin of anal; scales thin, strongly ctenoid, extending forward nearly to tip of snout, and on bases of second dorsal, anal, and ventral, and on basal half or so of caudal, 7 or 8 oblique rows between lateral line and first dorsal spine, and 6 or 7 between it and first ray of second dorsal; dorsal fins close together, the spines very slender, the third or fourth the longest, reaching beyond the tip of some of the succeeding spines if deflexed, 1.8 to 2.1 in head; second dorsal highest anteriorly, none of the rays as long as the longest spine, margin of fin nearly straight; caudal lunate, both lobes acute, the upper one slightly the longer; anal with a nearly straight margin, the second spine fairly strong, 2.5 to 2.8 in head; ventral rather large, reaching rather more than halfway to anal, 1.5 to 1.55 in head; pectoral fairly small, the third or fourth ray longest, 1.6 to 1.8 in head, 5.3 to 5.6 in length.

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[17] The preopercle has been described as unarmed. However, small spines are present at least at angle, though fairly well covered with skin in the adult, and well exposed in the small specimens herein described as a new species.

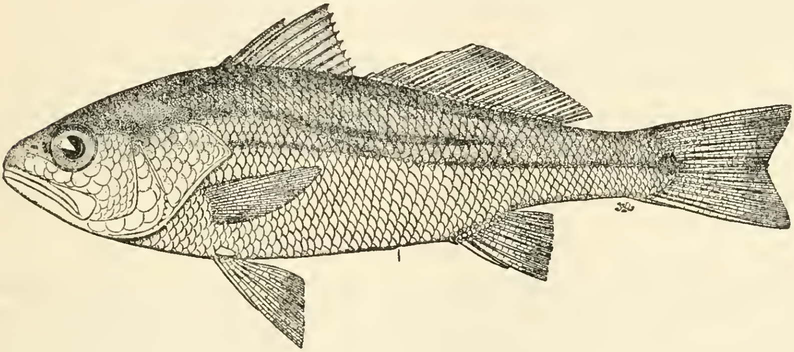

Figure 59.—*Odontoscion australis*, new species, From the type, 80 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 128023).

Color olive-gray on back, shading into the bright silvery of the lower parts along middle of side; back and side with three dark longitudinal stripes; the uppermost one extending from side of nape to origin of second dorsal, and thence along the base of this fin and on dorsal surface of peduncle; the second extending backward from upper posterior margin of eye, and disappearing below posterior part of second dorsal; the third one very narrow, and extending from posterior angle of opercle, and ending in a prominent caudal spot; opercle dark underneath near upper margin, this color showing through on the outside as a dark area; dorsal and caudal fins olive; the other fins paler.

Four specimens, 73 to 87 mm. (64 to 70 mm. to base of caudal) long, are included in the collection furnished by the Mission. These were taken with a seine in Lobos de Tierra Bay. A specimen 80 mm. (64 mm. to base of caudal) long (U.S.N.M. No. 128023) has been selected as the type. The following proportions and enumerations are based on the type: Head in length 3.0; depth 3.4; pectoral 5.3. Eye in head 4.2; snout 4.2; interorbital 4.4; maxillary 2.1; caudal peduncle 3.1; longest dorsal spine 1.9; second anal spine 2.8; ventral 1.5; pectoral 1.6. D. X–I, 25; A. II, 8; P. 15; scales 8–58; gill rakers 7+16.

The principal differences between this species and *O. xanthops* Gilbert, the only species heretofore known from the Pacific coast of America, are shown in the accompanying parallel comparison. As the specimens of the two species are of unequal size (those of *xanthops* being 150 to 180 mm. long), the differences in proportions and color shown may not be entirely reliable.

O. australis	*O. xanthops*
First dorsal with 10 spines.	First dorsal with 11 or 12 spines.
Pectoral with 15 or 16 rays.	Pectoral with 17 rays.
Body quite compressed, elongate, depth 3.4 to 3.75 in length.	Body more robust, rather deeper, depth 3.1 to 3.3 in length.
Eye small, 3.8 to 4.4 in head.	Eye 3.3 to 3.8 in head.
Sides with 3 dark longitudinal bands, and a large dark caudal spot.	Dark stripes extending along the rows of scales, longitudinal bands wanting, no caudal spot.

Range.—Known only from the type material from Lobos de Tierra Bay, Peru.

Genus SCIAENA Linnaeus, 1758

Body moderately elongate; head rather low, more or less conical; mouth terminal or inferior; teeth in jaws in a band, occasionally in a few series, the outer ones frequently and the inner series occasionally more or less enlarged; snout and mandible with conspicuous slits and pores; no barbels; preopercle usually with a crenulate membranous edge, sometimes with small spines at angle; gill rakers short, rather few, 8 to 15 more or less developed on lower limb of first arch; first dorsal with about 9 or 10 spines; second dorsal with about 21 to 28 soft rays; anal small, with about 8 to 10 soft rays. (The number of gill rakers and fin rays given applies only to species occurring in Peru.)

The series of scales are irregular, and enumerations based on one specimen, even if made by one individual, may vary by as much as three or four if counted two or more times. Whether they are counted in the lateral line, below it or above it, also makes a difference. The irregularity of the series of scales, together with the lack of uniformity in counting them no doubt has resulted in the wide differences in the number of scales given in different publications for one species. The number of scales given in the descriptions of the species of this genus that follow, as in virtually all descriptions in this catalog, is based on the vertical series, which were counted just above the lateral line. The number of longitudinal series includes only full rows, reduced scales at the base of the fins, if present, having been excluded. The number of scales may be used in separating groups, if the enumerations are made uniformly, but a difference of only a few scales may not be significant, as already stated.

KEY TO THE SPECIES

a. Body short; back high; depth about 2.5 in length; opercle with a large, dark, membranous flap---------------------------------- **fasciata** (p. 283)

aa. Body much more elongate; back lower; depth 3.0 or more times in length; opercle without a broad, membranous flap.

b. Snout projecting well beyond premaxillaries; mouth inferior; scales rather large, about 56 to 62 in a lateral series, and about 5 or 6 rows between lateral line and first dorsal spine.

c. Teeth in both jaws in rather broad bands, outer teeth in upper jaw somewhat enlarged and widely spaced; slightly enlarged teeth intermixed with the small ones in lower jaw----------------- **deliciosa** (p. 285)

cc. Teeth in upper jaw in a narrow band, with an outer close-set, notably enlarged series; teeth in lower jaw in 2 principal series, those of inner series enlarged---------------------- **callaensis**, new species (p. 287)

bb. Snout not projecting beyond premaxillaries; mouth terminal; scales smaller, about 70 to 80 in a lateral series, and 7 to 10 rows between lateral line and first dorsal spine.

d. Pectoral fin long, reaching about to tip of ventral, 4.8 to 5.2 in length; teeth in each jaw in 2 or 3 irregular series, the outer ones in each jaw somewhat enlarged; 13 to 15 gill rakers on lower limb of first arch; eye moderately large, 5.6 to 6.2 in head-------------- **gilberti** (p. 288)

dd. Pectoral fin short, not nearly reaching tip of ventral, 6.7 to 7.1 in length; teeth in upper jaw in a narrow band, the outer ones considerably enlarged, those of lower jaw in 2 irregular series, the inner series enlarged; 8 to 10 gill rakers more or less developed on lower limb of first arch; eye very small, contained 9 or more times in head.

e. Ten gill rakers on lower and 3 or 4 on upper limb of first arch; 9 or 10 rows of scales between lateral line and first dorsal spine; dorsal spines slender, fully as long as longest soft ray, 2.5 to 2.9 in head; ventral fin inserted close behind base of ventral------------ **starksi** (p. 290)

ee. Eight gill rakers on lower limb, and none developed on upper limb of first arch; 7 rows of scales between lateral line and first dorsal spine; dorsal spines rather strong, much shorter than longest soft ray, 4.1 in head; ventral inserted fully an eye's diameter behind base of pectoral-- **wieneri** (p. 292)

SCIAENA FASCIATA (Tschudi)

BURRITO; CARACHA; PINTADILLA; GALLINAZO

Cheilotrema fasciatum TSCHUDI, 1845, p. 13, pl. 1, Caleta of Chancay (between Callao and Huacho), Peru (original description).

Sciaena fasciata JORDAN and EIGENMANN, 1889, pp. 403, 407, Paita, Peru (diagnosis; synonymy; notes).—STARKS, 1906, p. 793, Callao, Peru (description).—EVERMANN and RADCLIFFE, 1917, p. 101, Chimbote, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 510, Chincha Islands, Paracas Bay, and Pacasmayo, Peru.

Johnius fasciatus FOWLER, 1940b, p. 777, "Peru".

Head 3.1 to 3.3; depth 2.5 to 2.75; D. X–I, 24 to 26; A. II, 8 or 9; P. 18; scales 63 to 70.

Body deep, rather strongly compressed, its greatest thickness somewhat greater than half its depth; back high; dorsal outline anterior to dorsal rather steep, strongly convex at nape; head short, deep; caudal peduncle rather slender, 2.8 to 2.9 in head; snout fairly short, blunt, projecting a little beyond the mouth, 3.4 to 3.65 in head; eye 4.9 to 5.6; interorbital 2.9 to 3.6; mouth rather small, low, nearly horizontal; lips papillose; maxillary reaching about to vertical from middle of eye, 2.9 to 3.2 in head; teeth in a broad band in each jaw, some of the anterior ones in upper jaw somewhat enlarged; gill rakers very short, mostly mere spiny tubercles, 8 or 9 including tubercles on lower and 4 or 5 on upper limb of first arch; preopercle with a nearly smooth membranous edge; opercle distally with a broad membranous flap; lateral line slightly arched anteriorly, then curved downward, reaching middle of side over base of anal; scales reduced anteriorly above lateral line, and at nape, strongly ctenoid extending far on the interradial membranes of the second dorsal, anal, ventrals, and pectorals, and covering the caudal fin entirely, except distally, 9 or 10 full oblique rows between lateral line and first dorsal spine, and an equal number between it and first ray of second dorsal; dorsal fins close together, the spines slender, the third the longest, 1.95 to 2.2; second dorsal rather high, with strongly convex margin, longest rays in anterior half of fin, rather notably shorter than the longest spines; caudal margin scarcely concave, with upper lobe slightly produced; anal with nearly straight margin, the second spine strong, 2.5 to 3.2 in head; ventral inserted well behind base of pectoral, 1.3 to 1.5 in head; pectoral rather short, not nearly reaching tip of ventral, 1.3 to 1.45 in head, 4.3 to 4.6 in length.

Color rather dark brown; pale underneath; a light band, about as wide as eye, extending downward on side under the last dorsal spines; a light area on upper part of side under middle of second dorsal; membranous flap of opercle black; inner side of gill covers pale; vertical fins brownish; ventral quite dark; pectoral dusky, darker on inner side.

The description is based on the four specimens, 240 to 270 mm. (193 to 220 mm. to base of caudal) long. One was taken at Pachacamac Island by the Mission; one was secured at Chimbote by R. E. Coker; and two are included in the Wilkes collection, labeled as from "Peru." The common names "burrito" and "burro" also seem to be assigned to *Pomadasys*.

This species is not mentioned anong the commercial species in the report of the Mission, and therefore probably is of little or no economic importance.

Range.—Coasts of Peru and Chile.

SCIAENA DELICIOSA (Tschudi)

Lorna; Cholo; Cachema; Ayanque

Figure 60

Corvina deliciosa Tschudi, 1845, p. 8, Peru (original description).

Sciaena deliciosa Jordan and Eigenmann, 1889, pp. 401 and 406, Peru and Panama (diagnosis; synonymy; notes).—Evermann and Radcliffe, 1917, p. 102, pl. 9, fig. 3, Callao and Mollendo, Peru (synonymy; description; note on size attained, and importance as food).—Nichols and Murphy, 1922, p. 510, Lobos de Tierra Island, North Chincha Island, Callao, and Paracas Bay.

Johnius deliciosus Fowler, 1940b, p. 776, "Peru."

Head 2.9 to 3.1; depth 3.2 to 3.5; D. X (rarely IX) –I, 21 to 24; A. II, 9 or 10; P. 18 (rarely 19); scales 57 to 62.

Body quite elongate, compressed, its greatest thickness about half its depth; back moderately elevated; dorsal outline convex at nape, gently convex over eyes and snout; head rather low, compressed; caudal peduncle moderately slender, compressed, 3.3 to 3.9 in head; snout rather long, more or less conical, projecting beyond mouth, 3.6 to 4.0; eye rather small, 5.2 to 6.9; interorbital 3.7 to 4.2; mouth moderately large, slightly oblique, inferior; lower jaw included; the gape anteriorly well below level of lower margin of eye; lips, maxillary, and chin papillose; maxillary reaching to or beyond vertical from middle of eye, 2.75 to 3.0 in head; teeth in upper jaw in a rather broad band, with an outer series of rather broadly spaced, somewhat enlarged teeth, though shorter than anterior nostril; band in lower jaw narrower, somewhat enlarged teeth rather irregularly intermixed with smaller ones; gill rakers short, those at angle scarcely longer than pupil, 13 to 15 more or less developed on lower, and 6 to 8 on upper limb of first arch; preopercle with rather fine membranous serrae, those at angle a little enlarged and supported by flat, osseous points; lateral line scarcely arched anteriorly, then curved downward, reaching middle of side above base of anal; scales moderately large, with flexible, ctenoid posterior edges, extending forward nearly to tip of snout, extending only slightly on base of second dorsal, not forming a sheath, present on at least basal half of interradial membranes of caudal, also extending slightly on bases of anal and pectoral, 6 full oblique rows between lateral line and first dorsal spine, and 7 between it and first ray of second dorsal; dorsal fins close together, the spines slender, the fourth usually longest, not reaching beyond the tip of succeeding spines, 2.2 to 2.9 in head; second dorsal long, with slightly convex margin, highest anteriorly, the highest rays rather notably shorter than the longest spines; caudal lunate, both lobes acute, the upper one slightly the longer; anal with a notably concave margin, the second spine moderately strong, rather variable in length, 3.0 to 4.0 in head; ventral inserted under or slightly behind base of pectoral, the outer ray sometimes with a slight filament, 1.7 to 1.9 in head; pectoral rather long, reaching well beyond tip of ventral, the fifth or sixth ray (counting downward) longest, 1.25 to 1.35 in head, 3.8 to 4.2 in length.

Color grayish above, with bluish metallic reflections; silvery below; rows of scales along side with rather definite dark streaks; inner lining of gill covers silvery, with scattered dusky points; fins all more or less dusky, the ventral lighter than the others; axil of pectoral black, this color extending diffusely on inner side of fin.

S. deliciosa is represented by nine specimens, 210 to 330 mm. (178 to 263 mm. to base of caudal) long. Two of these were furnished by the Mission, and the rest are included in the general collection of the U. S. National Museum. The specimens were collected at Lobos de Tierra Island, Callao, and Mollendo. It is stated in the report of the Mission (1943, p. 284) that the fish were caught with hand lines, gill nets, and seines and that an average length of about 250 mm. and a maximum length of about 400 mm. are attained. It is reported, furthermore, that fishes called "ayanques" were caught at Santa Island, and others called "cachema"[18] were taken at Puerto Pizarro and at Lobos de Tierra Island. This species is a highly prized food fish, of which rather large quantities are landed between Puerto Pizarro and Chala, the chief ports being Callao and Paita.

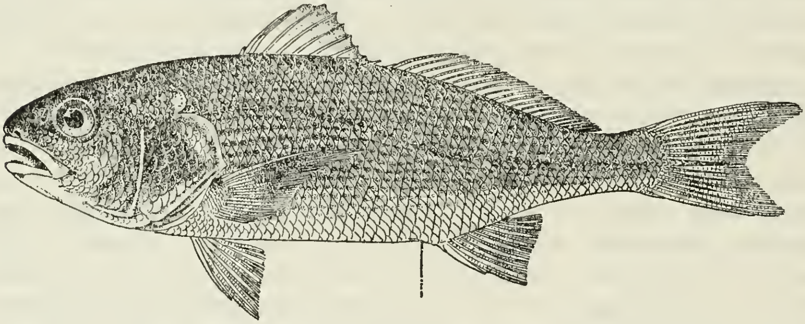

FIGURE 60.—*Sciaena deliciosa* (Tschudi). From a specimen 225 mm. long, Callao, Peru (U.S.N.M. No. 77651). (After Evermann and Radcliffe, 1917.)

Range.—Coast of Peru. Recorded from Panama Bay by Jordan and Eigenmann (see reference above), who identified a few specimens from Panama, in the Museum of Comparative Zoology, as this species. It has not been taken there by recent collectors.

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[18] It is probable that at least two species are included in the rather numerous local names that have been furnished by collectors, as the species are not well understood even by the taxonomist.

SCIAENA CALLAENSIS, new species

FIGURE 61

Head 3.0, 3.0; depth 3.1, 3.25; D. X–I, 23, X–I, 21; A. II, 9, II, 9; P. 18, 18; scales 56, 57.

Body moderately elongate, compressed, its greatest thickness about half its depth; back moderately high; dorsal outline rather strongly convex at nape, straight to slightly concave over eyes; head fairly deep, compressed; caudal peduncle rather deep, compressed, 3.7, 3.4 in head; snout long, conical, projecting beyond mouth, 3.4, 3.9 in head; eye rather small, 6.4, 5.4; interorbital 3.8, 4.1; mouth rather large, slightly oblique, inferior; lower jaw included; the gape anteriorly well below level of lower margin of eye; lips, maxillary, and chin papillose; maxillary reaching nearly to vertical from posterior margin of pupil, 2.55, 2.7 in head; teeth in upper jaw in a rather narrow band, with an outer closely set series of enlarged teeth, about as long as anterior nostril; teeth in lower jaw principally in 2 series, with the inner series enlarged at least laterally; gill rakers short, those at angle not quite as long as pupil, 14, 15 more or less developed on lower and 7, 8 on upper limb of first arch; preopercle with a serrated membranous edge; lateral line slightly arched anteriorly, becoming horizontal above base of anal; scales rather large, with slightly flexible ctenoid posterior edges, extending forward nearly to tip of snout, extending on base of second dorsal, not forming a continuous sheath, present on at least basal half of interradial membranes of caudal, also extending slightly on bases of anal and pectoral, 5, 6 full oblique rows between lateral line and first dorsal spine and 6, 7 between it and first ray of second dorsal; dorsal fins contiguous, the spines slender, the fourth one longest, not reaching beyond tips of succeeding spines, 2.7, 2.4 in head; second dorsal long, low, highest anteriorly (slightly injured in the specimens at hand); caudal rather deeply lunate (slightly injured), both lobes

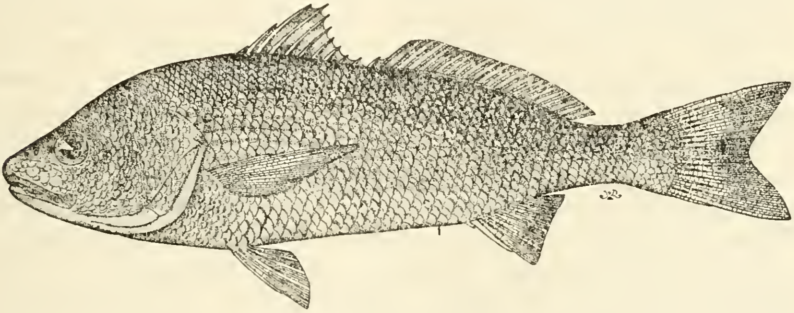

FIGURE 61.—*Sciaena callaensis*, new species. From the type, 340 mm. long, Callao Bay, Peru (U.S.N.M. No. 36934).

evidentally acute; anal with a gently concave margin, the second spine rather slender, 4.1, 3.25 in head; ventral inserted very slightly behind base of pectoral, 1.9, 1.75 in head; pectoral quite long, reaching more than an eye's diameter beyond tip of ventral, the fifth and sixth rays (counting downward) longest, 1.3, 1.25 in head, 3.9, 3.7 in length.

Color of old preserved specimens grayish above, with bluish metallic reflections; pale silvery below; rows of scales along side with rather definite dark streaks; inner lining of gill covers pale silvery, with few dusky points; fins, exclusive of ventrals, all more or less dusky; axil of pectoral black, this color extending diffusely on inner side of fin.

Only two specimens, 340 and 230 mm. (270 and 185 mm. to base of caudal) long, both from Callao Bay, are at hand. The larger one (U.S.N.M. No. 36934) has been designated as the type. The proportions and enumerations given first in each instance apply to the type. The specimens are only in fair condition, having been collected by W. H. Jones in 1884.

This species is very close to *S. deliciosa,* from which it differs chiefly in dentition. In the present species the teeth in the upper jaw are in a narrower band, and the outer ones are larger and in a close-set series; and those of the lower jaw are in two principal series (not in a band), with those of the inner series notably enlarged. The body apparently is slightly deeper; the outline over the eyes is straight or slightly concave, instead of gently convex; the maxillary is a little longer; the scales are a little less numerous; and the pectoral is rather longer. The small paratype, however, overlaps slightly with specimens of *S. deliciosa* in all the characters mentioned, exclusive of the dentition, and the length of the maxillary. The dentition in *S. callaensis,* in fact, is in agreement with the large specimen herein identified as *S. wieneri.* That species differs rather notably in having more numerous scales in a lateral series and in having much shorter pectoral fins.

Range.—Known only from the type material from Callao Bay, Peru.

SCIAENA GILBERTI Abbott

CORVINA; CORVINITA; LORNA

Sciaena gilberti ABBOTT, 1899, p. 355, Callao, Peru (original description; compared with *S. deliciosa*).—EVERMANN and RADCLIFFE, 1917, p. 103, pl. 10, fig. 1, Callao, Peru (references; description).—NICHOLS and MURPHY, 1922, p. 510, Callao, Peru.

Head 3.0 to 3.4; depth 3.5 to 3.7; D. IX–I, 21 to 23; A. II, 9; P. 17 to 19; scales 72 to 76.

Body rather elongate, compressed, its greatest thickness somewhat greater than half its depth; back not greatly elevated; dorsal outline gently convex at nape, nearly straight over eyes and snout; head rather long, compressed; caudal peduncle rather long, moderately compressed, 2.95 to 3.0 in head; snout moderately long, conical, 3.5 to 3.7; eye moderate, 5.6 to 6.2; interorbital 4.25 to 4.5; mouth large, oblique, nearly or quite terminal, anteriorly at or below level of lower margin of eye; maxillary, lips, and chin not papillose; maxillary extending to or a little beyond middle of eye, 2.5 in head; teeth in each jaw in 2 or 3 irregular series, the outer ones in each jaw somewhat enlarged; gill rakers short, those at angle scarcely longer than pupil, 13 to 15 more or less developed on lower and 6 to 8 on upper limb of first arch; margin of preopercle with rather weak serrae; lateral line slightly arched anteriorly, then curved downward, reaching middle of side above origin of anal; scales small, with membranous, ctenoid edges, extending forward on snout, missing on lips and on anterior half or so of mandible, extending slightly on base of second dorsal, but not forming a sheath, extending on lower two-thirds or so of membranes of caudal, also somewhat on base of pectoral, 8 rows between lateral line and first dorsal spine and 8 or 9 between it and first ray of second dorsal; dorsal fins close together, the spines fairly long and slender, the third slightly longer than the fourth, but not reaching beyond the tips of any of the succeeding spines, 2.0 to 2.2 in head; second dorsal long, with slightly convex margin, highest anteriorly, the longest rays rather notably shorter than the longest spines; caudal lunate, both lobes acute, the upper one slightly the longer; anal with a gently concave margin, the second spine rather long and slender, about two-thirds length of longest soft ray, 3.2 to 3.8 in head; ventral inserted about half diameter of eye behind base of pectoral, the inner ray without a filament, 1.5 to 1.9 in head; pectoral moderate, reaching about to tip of ventral, pointed, the fourth or fifth ray (counting downward) longest, 1.4 to 1.6 in head, 4.8 to 5.2 in length.

Color grayish brown, with bluish reflections above; pale silvery underneath; rows of scales with faint dark lines; inside lining of opercle dusky; fins more or less dusky, at least at base; axil of pectoral dark.

The description, exclusive of the color, is based on three specimens, respectively 345, 375, and 385 mm. (278, 305, and 318 mm. to base of caudal) long. The two larger ones were taken at Callao by R. E. Coker and the smallest one in Sechura Bay by the Mission. The color description is based on the last-mentioned specimens, as the others are badly faded. This species agrees with *S. wieneri* in having small scales, but they do not form a continuous sheath on the base of the second dorsal; the teeth are different; the spines of the dorsal and anal are longer, and those of the dorsal are fewer; the pectoral fin is longer; and the eye is larger.

Range.—Coast of Peru.

SCIAENA STARKSI Evermann and Radcliffe

Robalo; Robalito

Figure 62

Sciaena gilberti Starks (name preoccupied by *S. gilberti* Abbott, 1899), 1906, p. 794, pl. 56, fig. 3, Callao, Peru (original description; compared with *S. wieneri*).

Sciaena starksi Evermann and Radcliffe (new name), 1917, p. 104, Callao, Peru (reference; description; notes on size attained, and value as food fish).

Head 3.25, 3.3; depth 3.5, 4.0; D. X–I, 21, X–I, 22; A. II, 10, II, 10; P. 18, 19; scales 77, 73.

Body elongate, compressed, its greatest thickness somewhat more than half its depth; back not greatly elevated; dorsal outline nearly straight over the head, slightly to moderately convex in advance of first dorsal; head rather long and low; caudal peduncle moderately long, compressed, 3.2, 3.5 in head; snout long, rather pointed, 3.85, 3.75; eye very small, 10.0, 9.75; interorbital 3.6, 3.7; mouth large, oblique, terminal; gape anteriorly near level of middle of eye; maxillary, lips, and chin not papillose; maxillary reaching to or beyond posterior margin of eye, 2.4, 2.4 in head; teeth in upper jaw in a narrow band, with a considerably enlarged outer series, those of lower jaw principally in two irregular series, the inner series enlarged; gill rakers few, those at angle about two-thirds length of eye, 10, 10 more or less developed on lower and 3, 4 on upper limb of first arch; preopercle with a serrulate, membranous edge on vertical margin, with small, sharp spines at angle; lateral line somewhat arched anteriorly, becoming horizontal above base of anal; scales small, ctenoid, extending forward to tip of snout, forming a narrow sheath on base of second dorsal and anal, but not extending on the fins, extending at least on basal half

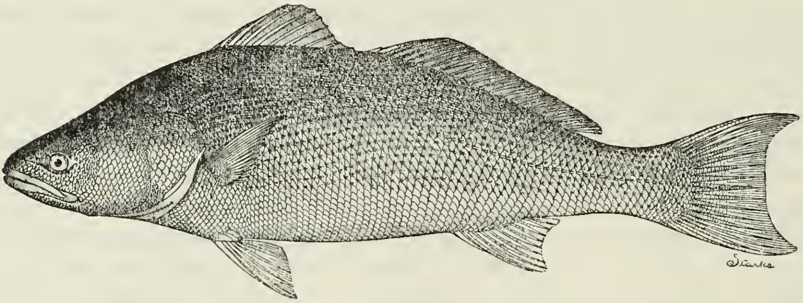

Figure 62.—*Sciaena starksi* Evermann and Radcliffe. From the type of *S. gilberti* Starks, 490 mm. long, Callao, Peru (U.S.N.M. No. 53464). (After Starks, 1906.)

of interradial membranes of caudal, also extending slightly on base of ventral and of pectoral, 10, 9 slightly oblique rows between lateral line and first dorsal spine, about an equal number between it and first ray of second dorsal; dorsal fins close together, the spines moderately strong, the third or fourth longest, not reaching beyond tip of any succeeding spine, 2.5, 2.9 in head; second dorsal long, rather low, highest anteriorly, the longest rays a little shorter than the longest spines; caudal rather deeply lunate, both lobes acute, the upper one slightly the longer; anal with a rather deeply concave margin, the second spine moderately small, about half as long as first soft ray, 6.0, 5.75 in head; ventral inserted almost immediately behind base of pectoral, 2.0, 2.0 in head; pectoral rather short, not reaching tip of ventral, the fifth and sixth rays (counting downward) longest, 2.1, 2.0 in head, 6.8, 6.7 in length.

Color of old preserved specimens grayish brown above, with bluish reflections; lower parts yellowish straw color, with silvery reflections; rows of scales, except on lower parts, marked with dark lines; dorsal fins, caudal, and pectoral more or less dusky; other fins paler.

The description is based on two specimens, the type of *S. gilberti* Starks (U.S.N.M. No. 53464), which is *S. starksi* Evermann and Radcliffe, as shown by the synonymy given at the head of this account, and another specimen (U.S.N.M. No. 77731), secured by R. E. Coker. The specimens are from Callao and La Ventanilla and are 490 and 460 mm. (391 and 382 mm. to base of caudal) long. In the description the proportions and enumeration given first in each instance pertain to the type. According to R. E. Coker, as quoted by Evermann and Radcliffe (see reference above), this species reaches a weight of 30 to 40 pounds. However, *S. wieneri* seems to bear the local name "robalo." The two species, if indeed they are distinct, are not known to have been recognized by collectors. A large specimen, 1,000 mm. long, furnished by the Mission, seems to be *S. wieneri*, and is so named and described in these pages. Although several differences are apparent between this large specimen and the much smaller ones herein described as *S. starksi*, it is impossible to determine to what extent they are the result of the great difference in size, or perhaps individual variation. It would not be surprising if the study of additional specimens, especially of intermediate sizes, would show *S. starksi* to be a synonym. For the present, then, it may be regarded as uncertain that *S. starksi* attains the large size ascribed to it. The differences in structure noticed are shown in the parallel comparison supplied herewith.

S. wieneri	*S. starksi*
Eight gill rakers on lower limb, and a few coarse tubercles on upper limb, of first arch.	Ten gill rakers on lower limb, and 3 or 4 on upper limb, of first arch.
Seven oblique rows of scales between lateral line and first dorsal spine.	Nine or ten oblique rows of scales between lateral line and first dorsal spine.
Ventral fin inserted fully an eye's diameter behind base of pectoral, somewhat longer than pectoral, 2.15 in head.	Ventral fin inserted close behind base of pectoral, of about same length as pectoral, 2.0 in head.
Caudal deeply lunate, the lobes of about equal length.	Caudal deeply lunate, the upper lobe notably longer than the lower.
Dorsal spines quite low, rather strong, the longest one 4.1 in head.	Dorsal spines longer, quite slender, the longest 2.5 to 2.9 in head.
Longest soft ray of dorsal much longer than the longest spine.	Longest soft ray of dorsal rather shorter than longest spine.
Second anal spine small, firmly bound to first soft ray, its point not free, about a third the length of first soft ray, 7.5 in head.	Second anal spine larger, less firmly bound to first soft ray, its point free, about half length of first soft ray, 5.75 to 6.0 in head.
Eye 13.0 in head.	Eye 9.75 to 10.0 in head.
Margin of preopercle with two rather broad indentations, the spines at angle covered by membrane.	Margin of preopercle evenly rounded, without indentations, the spines at angle sharp, distinctly projecting beyond the membrane.
Brown stripes along the rows of scales discontinued abruptly on about lower fourth of side and in advance of vertical from second anal spine, but extending to base of anal behind this line.	Brown stripes along rows of scales becoming gradually indistinct on lower part of side, not extending on side to base of anal.

Although the Mission did not furnish specimens of *S. starksi*, as already stated, it is listed in the report (1943, p. 283) among the commercially important fishes, and therein it is stated, "It is reported to attain a weight of over 50 pounds." Landings are listed from several ports in northern and middle Peru.

Range.—Known only from Peru.

SCIAENA WIENERI Sauvage

ROBALO

Sciaena wieneri SAUVAGE, 1883, p. 156, "Peru" (original description).—STARKS, 1906, p. 796 (compared with *S. gilberti* under the description of that species).—EVERMANN and RADCLIFFE, 1917, p. 105 (references; note).

Head 3.2; depth 3.8; D. X–I, 23; A. II, 10; P. 19; scales 78.

Body moderately compressed, its greatest thickness about two-thirds its depth; back elevated, dorsal profile quite convex at nape, nearly straight over eyes and snout; head long, fairly low, somewhat compressed; caudal peduncle rather long, compressed, 3.4 in head;

snout long, pointed, 3.7 in head; eye quite small, 13; interorbital 3.5; mouth large, gently oblique, terminal; gape anteriorly little above level of lower margin of eye; maxillary reaching a little beyond posterior margin of eye, 2.55 in head; teeth in upper jaw in a narrow band, with the outer series notably enlarged, the largest ones about two-thirds length of pupil, those in lower jaw principally in 2 series, those of inner series enlarged, but smaller than the enlarged teeth of upper jaw; gill rakers short, those at angle about half length of eye, 8 more or less developed on lower limb of first arch, upper limb with a few coarse tubercles only; margin of preopercle with 2 rather broad indentations in vertical limb, with a ciliated membrane below upper concavity, with small spines covered by membrane at lower angle; lateral line slightly arched anteriorly, becoming horizontal over middle of anal; scales with flexible ctenoid edges, extending forward on snout and on posterior half of mandible, forming a narrow sheath on base of second dorsal, but not extending on this fin, or on anal, and only slightly on bases of ventral and pectoral, extending on interradial membranes of caudal nearly to its margin, 7 oblique rows between lateral line and first dorsal spine, and 8 between it and first ray of second dorsal; dorsal fins close together, the spines rather strong, short, the fourth largest, not reaching tip of any of the succeeding ones if deflexed, 4.1 in head; second dorsal long and low, with an evenly convex margin highest anteriorly, the longest rays exceeding length of the longest spine; caudal fin deeply lunate, both lobes acute and of about equal length; anal with concave margin, the second spine bound closely to the first soft ray, its tip not free, little more than a third the length of first soft ray, 7.5 in head, ventral inserted fully an eye's diameter behind base of pectoral, long and pointed, not quite extending halfway to vent, 2.15 in head; pectoral short and broad, not nearly reaching tip of ventral, sixth ray (counting downward) longest, 2.2 in head, 7.1 in length.

Color grayish, with bluish reflections, above; silvery below; rows of scales on side with more or less broken, brown stripes, the brown color ending rather abruptly on about lower fourth of side at vertical from second anal spine, but extending down to base of fin behind this line; inside lining of gill covers dusky; membranous margin of opercle dusky; fins all more or less dusky brown, the ventrals paler than the other fins, pectorals quite dark on inner side.

This species is represented by a single specimen, 1,000 mm. (837 mm. to base of caudal) long, taken by the Mission off Guañape Island on a line trawl, set in about 10 fathoms of water. It was known previously only from the original description. To identify this specimen with *S. wieneri* considerable allowance must be made for differences in the method and place of enumerating the scales, for individual variation, and perhaps for error in counting, as the original description gives 85 scales in lateral line. Other characters mentioned in the original description are in fair agreement with the specimen at hand.

Range.—Known only from Peru.

Genus OPHIOSCION Gill, 1863

Body elongate, more or less compressed; head rather low and short, not especially broad between the eyes, the bones rather firm (not notably cavernous); snout usually projecting more or less beyond premaxillaries; slits and pores about the mouth well developed; mouth generally nearly horizontal; teeth in each jaw in a band; preopercular margin serrate; gill rakers usually quite short; scales ctenoid, extending more or less at least on second dorsal, caudal, and anal; caudal fin lanceolate to double truncate; first dorsal generally with 10 or 11 spines; second dorsal with about 20 to 30 soft rays; anal with 2 spines and about 7 to 9 soft rays.

This genus heretofore has not been recorded from Peru. In addition to the new species described, the collection contains a juvenile, 45 mm. long, seined in Chilca Bay, which apparently is not identifiable with any known species. However, because of its small size and not especially good condition it will be mentioned only briefly. It differs from *O. obscurus* herein described in having a lower and broader head; a shorter snout, which scarcely projects beyond the premaxillaries; the body and especially the caudal peduncle are slenderer; the second dorsal spine is no stronger than the third; and the second dorsal is a little shorter, having only 23 rays.

It seems to be worth mentioning that in 54 specimens, of 8 species, mostly from the coasts of Panama, the number of rays in the anal fin is absolutely constant within a species. Therefore, the differences of a single ray in this fin apparently may be regarded as of specific importance.

OPHIOSCION OBSCURUS, new species

FIGURE 63

Head 3.5, 3.3; depth 3.3, 3.0; D. X–I, 26, X–I, 25; A. II, 7, II, 7; P. 17, 18; scales 57, 56.

Body elongate, compressed, its greatest thickness little more than half its depth; back thin, elevated; dorsal outline gently convex in advance of dorsal fins; ventral outline nearly straight and horizontal; head compressed; caudal peduncle rather strongly compressed, 2.6, 2.6 in head; snout moderately long, blunt, projecting well in advance of premaxillaries, 3.9, 4.0 in head; eye 3.5, 3.4; interorbital convex, 4.0, 3.9; mouth inferior, nearly horizontal; lower jaw included; maxillary reaching vertical from posterior margin of pupil, 2.7, 2.6 in head; teeth in each jaw in a band, the outer series in upper jaw somewhat enlarged; preopercular margin serrate, the serrae increasing in size gradually toward the angle, the spine at angle largest, directed slightly downward; gill rakers well developed, those at angle about as long as pupil, 14, 12 on lower and 7, 6 on upper limb of first arch; lateral line with a long arch, becoming horizontal over anal; scales strongly ctenoid, becoming smooth only in advance of interorbital, exposed portion short and deep, especially anteriorly below lateral line, few scales beyond the narrow sheaths at base of second dorsal and anal, extending on bases of caudal, ventral, and pectoral, the rows above lateral line oblique, those below it horizontal, 6 rows between lateral line and first dorsal spine, 4 on caudal peduncle above lateral line (exclusive of median row) and 5 below it; dorsal fins scarcely separate, the second spine stronger than the third, and fully three-fourths as long, the latter flexible, 1.6 in head; second dorsal highest anteriorly, the longest rays about as long as the second dorsal spine; caudal fin slightly damaged, apparently somewhat lanceolate; second anal spine large, nearly as long as the longest soft rays, 1.9, 1.95 in head; ventral inserted at vertical from base of lower rays of pectoral, 1.3, 1.25 in head; pectoral short, scarcely reaching tip of ventral, 1.33, 1.33 in head, 4.6, 4.5 in length.

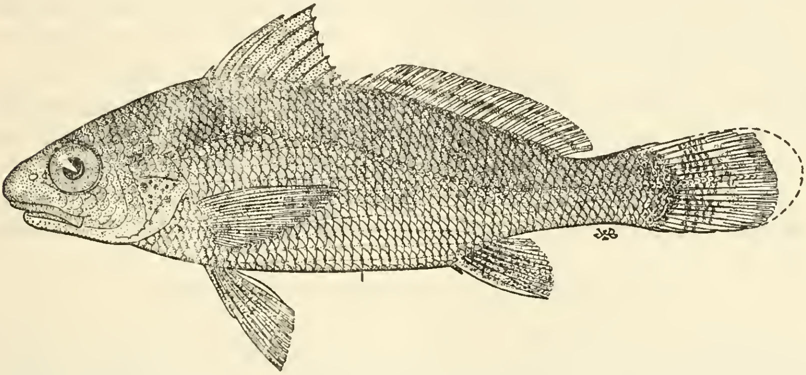

Figure 63.—*Ophioscion obscurus*, new species. From the type, 72 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 128029).

Color dusky brown above; this color shading into the dusky silvery gray of the lower parts; everywhere, except chest and lower surface of head, with dusky points of unequal size; an elongate dark blotch on opercle in advance of lateral line; a narrow dark streak along about anterior half lateral line; rather obscure dark lines along the rows of scales; fins all with dusky dots, the spinous dorsal, anterior part of anal, and the distal parts of the ventral and pectoral quite dark; second dorsal with a translucent streak near base, then a dark band, and again translucent distally; caudal with dark and pale blotches.

The description is based on 2 small specimens with slightly damaged caudal fins, about 72 and 68 mm. (56 and 54 mm. to base of caudal) long, the only ones at hand. These were seined in Lobos de Tierra Bay by the Mission. The larger specimen (U.S.N.M. No. 128029) has been designated as the type. The proportions and enumerations mentioned first in each instance pertain to the type. These specimens differ from those of *O. typicus* Gill, *O. sciurus* (Jordan and Gilbert), and *O. imiceps* (Jordan and Gilbert), related species from Panama Bay, in having longer gill rakers, deeper scales, in having only 7 instead of 8 soft rays in the anal, and in being notably darker in color. In shape and form they resemble *O. typicus*, differing further, however, in having a more compressed head, a less strongly projecting snout, and 25 or 26 rays in the second dorsal, instead of only 22 or 23 as in *O. typicus*. The Peruvian specimens differ from *O. sciurus* in having 6 or 7 rows of scales between the lateral line and first dorsal spine, instead of only 5, and they also have 4 rows above and 5 below the lateral line (exclusive of the median series) on caudal peduncle, whereas *sciurus* has only 3 and 4, respectively; and the pectoral fin is shorter, failing to reach tip of ventral, whereas it reaches well beyond tip of ventral in *sciurus*. The Peruvian specimens perhaps are nearest those of *O. imiceps*, from which they differ, however, in addition to the characters already mentioned, in having a more strongly projecting snout, shorter pectoral, and in having smaller and more numerous serrae (about 11 or 12, instead of 7) on the preopercular margin.

The name *obscurus* is given in allusion to the dark color.

Range.—Known only from the type material from Lobos de Tierra Bay.

Genus LARIMUS Cuvier and Valenciennes, 1830

Body only moderately elongate, compressed; back elevated; head rather short, compressed; snout short; mouth large, strongly oblique to vertical; lower jaw projecting; preopercular margin without bony teeth; gill rakers long and slender about 15 to 25 on lower limb of first arch; skull without conspicuous caverns; second dorsal long, with about 20 to 30 soft rays; anal short, usually with only about 6 or 7 soft rays.

Two species are represented in the Peruvian collections now at hand. The eye in these species is rather odd in shape, as its longest diameter extends downward and slightly backward.

KEY TO THE SPECIES

a. Mouth nearly vertical; maxillary extending about to vertical from front of pupil; pectoral longer than head, 2.8 to 3.1 in length, with 15 or 16 rays -- **effulgens** (p. 296)

aa. Mouth only moderately oblique; maxillary extending fully to vertical from posterior margin of pupil; pectoral shorter than head, 3.6 in length, with 18 rays -------------------------------- **gulosus**, new species (p. 298)

LARIMUS EFFULGENS Gilbert

Larimus effulgens GILBERT, *in* Jordan and Evermann, 1898, p. 1421, Panama Bay (original description).—GILBERT and STARKS, 1904, p. 123, pl. 16, fig. 33, Panama Bay (description; compared with *L. argenteus* and

L. acclivis).—MEEK and HILDEBRAND, 1925, p. 685, Panama Bay (references; description; range).

Head 3.1 to 3.3; depth 2.7 to 3.0; D. IX or X–I, 28 to 30; A. II, 6 or 7; P. 15 or 16; scales 45 to 50.

Body moderately short, compressed, its greatest thickness about two-fifths its depth; back elevated; dorsal profile anteriorly rather gently and evenly convex; head short, deep, compressed; caudal peduncle slender, 3.1 to 3.4 in head; snout short, blunt, 5.6 to 5.9; eye 3.9 to 4.4; interorbital 4.7 to 5.4; mouth very strongly oblique, but not quite vertical; lower jaw projecting, upper surface of its tip about on level with middle of eye; maxillary extending about to vertical from front of pupil, 2.0 to 2.1 in head; teeth very small, mostly in a single close-set series in each jaw; gill rakers long, slender, those at angle nearly as long as eye, 20 or 21 on lower and 10 or 11 on upper limb of first arch; lateral line slightly arched anteriorly, decurved under anterior part of second dorsal, attaining middle of side under middle of fin; scales strongly ctenoid, rows above lateral line anteriorly directed upward and backward, 5 rows between lateral line and base of first dorsal spine, also 5 between it and base of first ray of second dorsal, 18 or 19 vertical series between base of ventral spine and origin of anal, forming a sheath one scale wide at base of second dorsal, also extending more or less on all the fins exclusive of spinous dorsal; dorsal fins close together, the spines slender, the third longest, but not reaching beyond tips of the succeeding ones if deflexed, 1.8 to 2.1 in head; second dorsal long and rather low; caudal somewhat damaged, middle rays evidently longest; anal small, second spine enlarged, 2.3 to 2.6 in head, origin of fin under middle of second dorsal, its base 4.4 to 5.0 in head; ventral inserted under base of pectoral, reaching beyond vent, 1.2 to 1.3 in head; pectoral very long, reaching well beyond tip of ventral, a little longer than head, 2.8 to 3.1 in length.

Color bluish gray with silvery reflections above; silvery below; mandible especially bright silvery; very indefinite dark lines, if any, along the rows of scales; inside lining of opercle black; spinous dorsal dusky; other fins plain; axil of pectoral dark. Color of a fresh specimen from Panama, grayish above; silvery below; faint dark streaks along rows of scales on back and sides; dorsal and caudal mostly dusky, the lower rays of caudal yellow; ventral and anal orange.

Five specimens, 205 to 220 mm. (160 to 178 mm. to base of caudal) long, were taken by the Mission in an otter trawl in the Gulf of Guayaquil, off Puerto Pizarro. The specimens were compared with three cotypes from Panama Bay, with which they seem to be in almost perfect agreement.

Range.—Panama to northern Peru. Previously known only from Panama Bay.

LARIMUS GULOSUS, new species

BERECHE

FIGURE 64

Larimus pacificus EVERMANN and RADCLIFFE (not of Jordan and Bollman), 1917, p. 98, pl. 9, fig. 1, Lobos de Tierra, and Callao, Peru (references; description).—REGAN, 1913, p. 279 (probably not of Jordan and Bollman), Lobos de Tierra, Peru (listed as from 5 to 8 fathoms, without comment).

Head 3.15; depth 3.15; D. X–I, 27; A. II, 6; P. 18; scales 49.

Body moderately elongate, quite compressed, its greatest thickness a little less than half its depth; back moderately elevated; dorsal profile anteriorly gently convex; head moderately long, compressed; caudal peduncle rather long, slender, 3.6 in head; snout blunt, 4.4 in head; eye moderate, 4.5 in head; interorbital 4.0; mouth quite large, only moderately oblique; lower jaw strongly projecting, upper margin of its tip about on level with lower margin of pupil; maxillary reaching fully to posterior margin of pupil, 2.0 in head; teeth very small, in a single irregular series in each jaw; gill rakers long, slender, those at angle about as long as eye, 24 (given erroneously as 20 by Evermann and Radcliffe) on lower and 12 on upper limb of first arch; lateral line scarcely arched anteriorly, reaching middle of side above base of anal; scales strongly ctenoid, rows above lateral line rather irregular, anteriorly not parallel with it, 6 between lateral line and base of first dorsal spine, 5 between it and base of first ray of second dorsal, 25 vertical series between base of ventral spine and origin of anal, forming a sheath one scale wide at base of second dorsal; dorsal fins close together, the spines of the first fin slender, the third longest, but not reaching beyond the tip of the immediately succeeding rays if deflexed, much longer than the soft rays, 2.1 in head; anal small, the second spine moderately enlarged, 3.6 in head, origin of fin about under

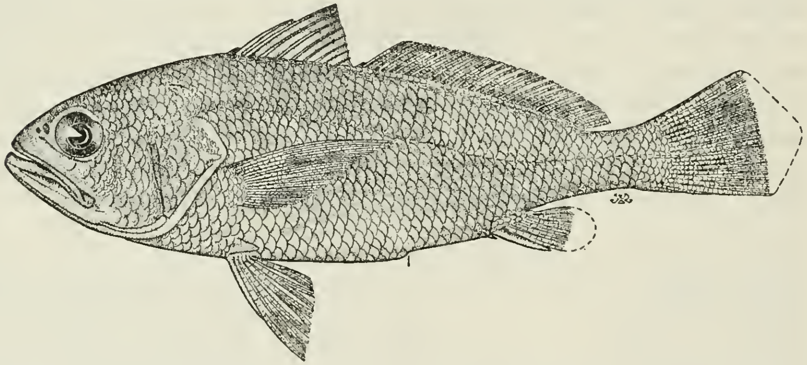

FIGURE 64.—*Larimus gulosus*, new species. From the type, 260 mm. long, Lobos de Tierra Island, Peru (U.S.N.M. No. 77694).

middle of second dorsal, its base 4.5 in head; ventral inserted under base of pectoral, failing to reach vent by a distance greater than diameter of eye, only about halfway to anal, 1.4 in head; pectoral moderately long, pointed, the third and fourth rays (counting downward) longest, 1.15 in head, 3.6 in length.

Color now quite dark. It was described by Evermann and Radcliffe (see reference above), in part, as follows: "Back dusky; sides yellowish; centers of scales dusky, forming dusky stripes along rows of scales * * *, becoming silvery on belly; fins dusky yellow; axil of pectoral black; skin lining region around pseudobranchiae black, this showing through opercle as a dark area."

The description is based on a single specimen (U.S.N.M. No. 77694), 260 mm. (215 mm. to base of caudal) long, from Lobos de Tierra Island, collected by R. E. Coker. This is the larger of two specimens described by Evermann and Radcliffe (see reference above) as *L. pacificus*. The second specimen, which was listed as from Callao, cannot now be found. The specimen at hand was compared with the type of *L. pacificus* (U.S.N.M. No. 41168) from Panama Bay, 135 mm. (107 mm. to base of caudal) long, and was found to differ in having more numerous gill rakers, apparently rather shorter ventrals, with fewer scales between the base of ventral and origin of anal, and the scales above the anterior part of the lateral line are less nearly parallel with it and the rows are more numerous. The differences are shown in the accompanying parallel comparison. A second specimen of *L. pacificus* from the Gulf of California, 190 mm. (158 mm. to base of caudal) long, also was compared, and found to differ from the Peruvian fish in the same characters and to about the same degree as the type. The new species is named *gulosus* in allusion to its large mouth. The common name used was copied from Evermann and Radcliffe's account and presumably was furnished by R. E. Coker.

L. pacificus	*L. gulosus*
20 gill rakers on lower limb, and 10 or 11 on upper limb, of first arch.	24 gill rakers on lower limb, and 12 on upper limb, of first arch.
Ventral fin reaching more than halfway to origin of anal.	Ventral fin reaching about halfway to origin of anal.
20 vertical series of scales between base of ventral spine and origin of anal.	25 vertical series of scales between base of ventral spine and origin of anal.
Scales above anterior part of lateral line parallel with it (though not true on one side of the type), 5 rows between lateral line and base of first dorsal spine.	Scales above anterior part of lateral line not parallel with it, 6 rows between lateral line and base of first dorsal spine.

Range.—Known only from Peru, from a specimen from Lobos de Tierra. A specimen recorded from Callao by Evermann and Radcliffe (see reference above) very probably also was of this species.

Genus BAIRDIELLA Gill, 1861

Body moderately elongate, compressed; head fairly short, conical; mouth moderate, oblique to nearly horizontal; teeth small, no canines, generally in one or a few rows; margin of preopercle strongly serrate; skull little cavernous; gill rakers slender; second anal spine moderate or large.

A single species, new to the fauna of Peru, is represented in the collections now at hand.

BAIRDIELLA ENSIFERA (Jordan and Gilbert)

Sciaena ensifera JORDAN and GILBERT, 1882c, p. 313, Panama Bay; also "Punta Arenas," presumably Costa Rica (original description; compared with *B. armata* and *B. icistia*).

Bairdiella ensifera MEEK and HILDEBRAND, 1925, p. 632, Panama Bay (synonymy; description; range, its northern limit probably incorrectly stated).

Head 3.4, 3.5; depth 3.1, 3.3; D. X–I, 23, X–I, 23; A. II, 8; II, 8; P. 17, 17; scales 67, 71.

Body moderately elongate, compressed, its greatest thickness equal to about half its depth; back elevated; profile nearly straight over eyes, strongly convex at nape; head fairly short, compressed; caudal peduncle long, rather slender, 2.8, 2.9 in head; snout conical, 4.6, 4.9; eye vertically slightly elongate, 3.6, 3.9; interorbital 4.5, 4.6; mouth rather large, oblique, terminal; maxillary reaching a little beyond middle of eye, 2.2, 2.25 in head; teeth in the jaws minute, anteriorly in a band, laterally in a single series; margin of preopercle serrate, the lowermost spine directed downward; gill rakers slender, those at angle about half length of eye, 22, 22 on lower and 9, 10 on upper limb of first arch; lateral line somewhat arched anteriorly, reaching middle of body about under middle of second dorsal; scales strongly ctenoid, reduced anteriorly, the rows above lateral line not parallel with it, 9, 10 between lateral line and base of first dorsal spine, and 6, 6 between it and middle of base of second dorsal; dorsal fins close together (the spine herein counted with the second fin not closely attached to it), the spines moderately strong, the fourth spine longest, notably longer than longest soft rays, 1.6, 1.6 in head, margin of second dorsal convex; caudal very slightly double concave; anal small, the second spine greatly enlarged; reaching nearly to base of caudal if deflexed, 1.3, 1.3 in head, margin of fin concave, its origin under middle of second dorsal, its base 2.2, 2.4 in head; ventral large, inserted a little behind base of pectoral, 1.2, 1.2 in head; pectoral moderate, failing to reach tip of ventral, 1.15, 1.2 in head, 4.0, 4.2 in length.

Color silvery gray above; bright silvery below; rows of scales on upperparts of body with indistinct dark lines; membranes of spinous dorsal quite dusky; second dorsal and caudal dusky toward their margins; other fins mostly pale yellowish; axil of pectoral dark.

Two specimens, 240 and 265 mm. (190 and 210 mm. to base of caudal) long, taken in the Gulf of Guayaquil, off Puerto Pizarro, are included in the collection furnished by the Mission. Although this species has been reported from Guayaquil, Ecuador, it has not been recorded from Peru.

The specimens were compared with others from Panama Bay and with two from Guayaquil, Ecuador, with which they seem to agree almost perfectly.

Range.—El Salvador to northern Peru. Previously not recorded from Peru.

Genus STELLIFER Oken, 1817

Body elongate, more or less compressed; head generally rather low and broad; skull cavernous, usually spongy to the touch (variable among the species), the septa being reduced (in some species) to the thinness of honeycomb; mouth moderate, nearly horizontal to quite oblique; preopercular margin with 1 to about 7 or 8 spines; gill rakers long and slender, numerous (about 20 to 36 on lower limb of first arch in Peruvian species); first dorsal with about 10 to 15 spines, second dorsal with 1 spine and about 18 to 25 soft rays; anal with 2 spines and about 7 to 11 soft rays.

Only one species, *S. minor*, previously was recognized from Peru. The number has now been increased to five.

KEY TO THE SPECIES

a. Margin of preopercle with only 2 spines (situated at angle).
  b. Snout projecting far beyond premaxillaries; mouth nearly horizontal; 21 gill rakers on lower limb of first arch; lower spine of preopercle directed downward and forward .... **fürthii** (p. 302)
  bb. Snout projecting little, if at all, beyond premaxillaries; 26 to 34 gill rakers on lower limb of first arch; lower spine of preopercle directed downward and backward (not downward and forward).
    c. Skull rather firm; second dorsal with 25 or 26 rays; anal with 8 rays; 26 or 27 gill rakers on lower limb of first arch .... **oscitans** (p. 303)
    cc. Skull rather cavernous; second dorsal with 20 or 21 rays; anal with 10 rays; 31 to 34 gill rakers on lower limb of first arch.
      pizarroensis, new species (p. 304)
aa. Margin of preopercle with about 6 or 7 spines, those at angle generally more or less enlarged.
  d. Body rather elongate, only moderately compressed, its depth 3.1 to 3.5 in length; second dorsal spine shorter and notably stronger than the third one; second dorsal with 22 to 25 rays; anal with 9 rays; no definite dark stripes along the rows of scales.
    ericymba peruana, new subspecies (p. 305)
  dd. Body deeper, more strongly compressed, its depth 2.75 in length; second dorsal spine not much shorter or stronger than the third one; second dorsal with 20 rays; anal with 10 rays; definite dark stripes along the rows of scales .... **minor** (p. 308)

STELLIFER FÜRTHII (Steindachner)

Corvina fürthii STEINDACHNER, 1875b, p. 26, pl. 3, Panama Bay (original description).

Stellifer fürthii MEEK and HILDEBRAND, 1925, p. 622, Panama Bay (synonymy; description; range).

Head 3.5, 3.5; depth 2.8, 3.0; D. XI–I, 24, XI–I, 24; A. II, 9, II, 9; P. 20, 20; scales 50, 51.

Body moderately deep, compressed, its greatest thickness about half its depth; back thin, elevated; outline nearly straight over eyes, rather steep and gently convex from posterior margin of eyes to origin of dorsal; head low, broad, the bones not excessively cavernous; caudal peduncle moderately long, compressed, 2.6, 2.75 in head; snout projecting well beyond premaxillaries, 4.2, 4.4, in head; eye round, 4.4, 4.7; interorbital 2.8, 3.0; mouth inferior, wholly below level of eye; lower jaw included; maxillary reaching below posterior margin of eye, 2.5, 2.5 in head; teeth in each jaw in a band, the outer teeth in upper jaw somewhat enlarged, but of unequal size; preopercle with 2 strong spines at angle, the upper one directed backward, the lower one directed downward, or even a little forward; gill rakers short, none longer than pupil, 21, 21 on lower and 13, 14 on upper limb of first arch; lateral line strongly arched anteriorly, becoming horizontal about over origin of anal; scales ctenoid, becoming smooth on head and chest, covering most or all of second dorsal, caudal, anal, and pectoral fins, and extending more or less on first dorsal and on ventral, the rows of scales anteriorly parallel with lateral line, 5, 6 rows between lateral line and first dorsal spine; dorsal fins somewhat connected, the second spine rather strong, only about two-thirds length of the third, the latter the longest, flexible, 1.6, 1.8 in head; second dorsal highest anteriorly, the rays shorter than longest spines; caudal fin rounded, the longest rays just below middle of fin; second anal spine moderately long and strong, not reaching tips of longest rays, 1.8, 1.8 in head; ventral inserted below base of pectoral, 1.3, 1.4 (without filament) in head; pectoral long, pointed, reaching well beyond tip of ventral, about as long as head, 3.4, 3.8 in length.

Color grayish, with bluish green reflections above; this color shading into the pale silvery of the lower parts; rows of scales along back and side with indications of dark lines; fins more or less olivaceous; ventrals lighter; pectoral with a dusky axillary spot.

Two specimens, 170 and 178 mm. (137 and 141 mm. to base of caudal) long, both taken in the Gulf of Guayaquil, off Puerto Pizarro, are included in the collection furnished by the Mission. These examples were compared with others from Panama, with which they seem to agree in all respects.

Range.—Panama Bay to northern Peru. Previously reported only from Panama.

STELLIFER OSCITANS (Jordan and Gilbert)

Sciaena oscitans Jordan and Gilbert, 1882c, p. 312, Panama Bay (original description; compared with *S. fürthii*).

Stellifer oscitans Meek and Hildebrand, 1925, p. 621, Panama Bay (synonymy; description; range).

Head 3.45, 3.5; depth 2.95, 3.0; D. X–I, 26, XI–I, 25; A. II, 8, II, 8; P. 20, 20; scales 52, 52.

Body moderately deep, compressed, its greatest thickness about half its depth; back thin, elevated; outline nearly straight over eyes, moderately steep and convex from posterior margin of eye to origin of dorsal; head rather low, broad, the bones not excessively cavernous; caudal peduncle long and slender, 2.9, 3.1 in head; snout scarcely projecting beyond premaxillaries, 4.2, 4.4 in head; eye nearly round, 4.0, 4.2; interorbital broad, 2.6, 2.9; mouth oblique, the gape anteriorly a little above level of lower margin of eye; lower jaw slightly included; maxillary reaching to or a little beyond posterior margin of eye, 1.8, 1.85 in head; teeth in each jaw in a narrow band laterally, in 2 irregular series anteriorly, the outer teeth in upper jaw enlarged, and some of the inner ones in lower jaw; preopercle with 2 rather strong spines near angle, the upper one directed slightly outward and backward, the lower one downward and backward; gill rakers at angle nearly as long as eye 26, 27 on lower and 19, 20 on upper limb of first arch; lateral line, rather strongly arched anteriorly, becoming horizontal over origin of anal; scales moderate, ctenoid, becoming smooth on head and chest, covering most of dorsal fins, caudal, anal, and pectoral, but extending only slightly on base of ventral, the rows anteriorly running upward and backward, 6, 7 rows between lateral line and first dorsal spine; dorsal fins connected by a low membrane, the second spine notably stronger than the succeeding ones, though only about two-thirds length of the third, the latter flexible, 1.6, 1.9 in head; second dorsal highest anteriorly, the longest rays only a little shorter than the longest spines; caudal fin somewhat pointed, the middle rays longest; second anal spine quite long and strong, not quite reaching tip of longest soft ray, 1.5, 1.6 in head; ventral inserted below base of pectoral, 1.25, 1.3 in head without filament; pectoral long, pointed, reaching far beyond tip of ventral, a little longer than head, 3.0, 3.3 in length.

Color grayish brown above, this color shading into the silvery gray of the lower parts; indefinite dark lines along the rows of scales on upper part of body; fins all more or less olivaceous, with numerous dusky punctulations; anal with a dark margin; axil of pectoral dusky.

The description is based on two specimens, 140 and 155 mm. (109 and 121 mm. to base of caudal) long, taken in the Gulf of Guayaquil, off Puerto Pizarro, by the Mission. The specimens agree well with examples from Panama Bay, with which they were compared.

Range.—Panama Bay to northern Peru. Previously reported only from Panama.

STELLIFER PIZARROENSIS, new species

FIGURE 65

Head 3.4, 3.3; depth 3.1, 3.3; D. XI–I, 20, XII–I, 21; A. II, 10, II,10; P. 18, 17; scales 47, 48.

Body rather strongly compressed, its greatest thickness less than half its depth; back moderately elevated; outline in advance of dorsal gently convex; head rather short and deep, compressed, the bones quite cavernous; caudal peduncle slender, strongly compressed, 3.2, 3.6 in head; snout short, not projecting beyond premaxillaries, 4.2, 4.2 in head; eye somewhat oblong, its longest diameter oblique to axis of body, extending downward and backward, longitudinal diameter 3.7, 3.6 in head; interorbital rather narrow, 2.9, 3.0; mouth strongly oblique, terminal; the gape anteriorly a little below middle of eye; maxillary extending nearly to posterior margin of eye, 2.0, 2.1 in head; teeth in jaws anteriorly in 2 irregular series, laterally in a narrow band, the outer ones in upper jaw scarcely enlarged; preopercle with 2 strong diverging spines, both directed slightly outward, and the lower one obliquely downward and backward; a strong preopercular ridge present; gill rakers long and slender, those at angle nearly as long as eye, 31, 34 on lower and 19, 19 on upper limb of first arch; lateral line strongly arched, becoming horizontal over anal; scales rather weakly ctenoid, becoming smooth in advance of dorsal and on chest, covering the fins, except distally, the rows anteriorly parallel with lateral line, 5, 5 rows between it and first dorsal spine; dorsal fins more or less connected, the second spine notably stronger than the succeeding ones, though only about three-fourths as long as the third, the latter flexible, 1.7, 1.65 in head; second dorsal only a little higher anteriorly than posteriorly, the longest rays about as long as second spine of first dorsal; caudal some-

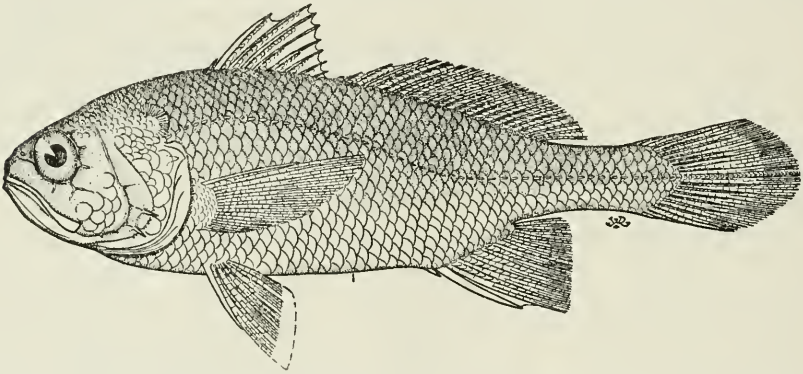

FIGURE 65.—*Stellifer pizarroensis*, new species. From the type, 130 mm. long, Puerto Pizarro, Peru (U.S.N.M. No. 128036).

what pointed; second anal spine rather strong, though shorter than adjacent soft ray, 1.9, 1.8 in head; ventral inserted at vertical from base of upper ray of pectoral, 1.3 in head (broken in type); pectoral long, reaching far beyond tip of ventral, 1.1, 1.15 in head, 3.8, 3.8 in length.

Color grayish brown above, with bluish reflections; this color shading into the silvery gray of the lower parts; fins more or less olivaceous, with dusky punctulations; first dorsal quite dark distally.

The description is based on two specimens, 130 and 77 mm. (100 and 59 mm. to base of caudal) long, furnished by the Mission. The proportions and enumerations based on the larger one, which has been designated as the type (U.S.N.M. No. 128036), are given first in each instance. This specimen was taken with an otter trawl in the Gulf of Guayaquil off Puerto Pizarro. The smaller one, and two juveniles, each about 25 mm. long, which apparently are of this species, were dredged in Sechura Bay. This species is related to *S. oscitans*, with which it agrees in the armature of the preopercle but differs as shown in the parallel comparison offered:

S. oscitans	*S. pizarroensis*
Skull rather firm.	Skull quite cavernous.
Eye round.	Eye obliquely elongate.
Mouth slightly inferior, moderately oblique, the gape anteriorly scarcely above level of lower margin of eye.	Mouth terminal, strongly oblique, the gape anteriorly little below middle of eye.
Maxillary reaching to or a little beyond posterior margin of eye, 1.8 to 1.85 in head.	Maxillary reaching little beyond posterior margin of pupil; 2.0 to 2.1 in head.
Dorsal rays X or XI–I, 25 or 26.	Dorsal rays XI or XII–I, 20 or 21.
Anal rays II, 8.	Anal rays II, 10.
Pectoral rays 20.	Pectoral rays 17 or 18.
Gill rakers 19 or 20 + 26 or 27.	Gill rakers 19 + 31 to 34.
Rows of scales above lateral line running obliquely upward; 6 or 7 rows between lateral line and first dorsal spine.	Rows of scales above lateral line nearly parallel with it; 5 rows between lateral line and first dorsal spine.

Range.—Northern Peru; Gulf of Guayaquil and Sechura Bay.

STELLIFER ERICYMBA PERUANA, new subspecies

FIGURE 66

Head 3.1 to 3.5; depth 3.1 to 3.5; D. XI or XII–I, 22 to 25; A. II. 9; P. 17 or 18; scales 47 to 50; vertebrae 24 (one specimen dissected).

Body fairly elongate, moderately compressed, its greatest thickness somewhat more than half its depth; back moderately elevated; outline over orbital region straight, gently convex at nape; head rather broad, the bones of skull very cavernous; caudal peduncle rather short, 3.2 to 3.9 in head; snout short, broad, not projecting beyond premaxillaries, 4.5 to 4.9 in head; eye small, somewhat oblong, its longest diameter oblique to axis of body, extending downward and backward, longitudinal diameter 4.8 to 5.4; interorbital 3.2 to 4.0; mouth moderately oblique, terminal, the gape anteriorly on or a little above level of lower margin of eye; maxillary extending nearly or quite under posterior margin of pupil, 2.2 to 2.5 in head; teeth in each jaw in a band, the outer series in upper jaw enlarged; preopercle with about 6 or 7 rather strong spines, all directed more or less backward; gill rakers at angle nearly as long as eye, 20 or 21 (rarely 19 or 22) on lower and 11 or 12 (rarely 10) on upper limb of first arch, total number 30 to 34; lateral line rather strongly arched, becoming horizontal over anal; scales ctenoid, becoming smooth only on interorbital, extending more or less on all the fins, covering second dorsal, caudal and anal rather densely, the rows above lateral line more or less parallel with it, 4 or 5 rows between it and first dorsal spine; dorsal fins somewhat connected, the second spine much stronger, though shorter than the immediately succeeding ones, the third one usually longest, 1.6 to 2.0 in head; second dorsal scarcely higher anteriorly than posteriorly, the longest rays about equal in length to second spine of first dorsal; caudal somewhat pointed, especially in young; second anal spine rather strong, about as long as adjacent soft ray, 1.5 to 1.9 in head; ventral inserted under base of pectoral, 1.2 to 1.6 in head; pectoral reaching little beyond tip of ventral, scarcely shorter than head, 3.6 to 3.9 in head.

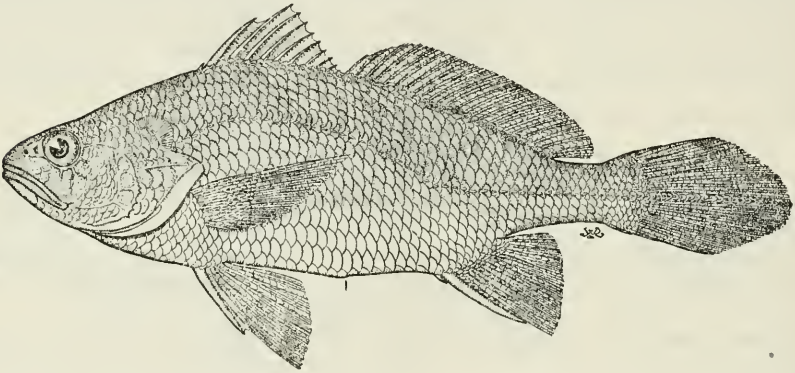

Figure 66.—*Stellifer ericymba peruana*, new subspecies. From the type, 145 mm. long, Puerto Pizarro, Peru (U.S.N.M. No. 128038).

Color grayish brown above, with bluish reflections; this color shading into the pale silvery of the lower parts; a small elongate dark area above free margin of opercle; fins more or less olivaceous, all with dusky points, largest on anal, ventral, and pectoral, these fins quite dusky in some specimens.

This apparently new subspecies is represented in the collection, made by the Mission, by 25 specimens, 35 to 145 mm. (30 to 112 mm. to base of caudal) long, all from the Gulf of Guayaquil, off Puerto Pizarro. A specimen (U.S.N.M. No. 128038), 145 mm. (114 mm. to base of caudal) long, has been selected as the type. The Peruvian specimens differ from 7 specimens, 145 to 150 mm. long, from Panama in having a greater average number of gill rakers, apparently a rather larger eye, narrower interorbital, and the second anal and third dorsal spines seem to be a little longer. However, as the Peruvian specimens mostly are smaller than the Panama ones, the proportions are not entirely reliable. These differences are shown in table 2. The eye in the Peruvian specimens apparently is somewhat more obliquely elongate than in the Panama examples, though there is some variation among specimens in this respect.

TABLE 2.—*Enumerations and proportions based on the subspecies of* Stellifer ericymba (*Jordan and Gilbert*)

Subspecies	Number of gill rakers on first arch														
	Upper limb			Lower limb					Total number						
	10	11	12	18	19	20	21	22	28	29	30	31	32	33	34
ericymba	3	6	-----	4	4	1	-----	-----	2	3	3	1	-----	-----	-----
peruana	1	11	5	-----	2	10	5	1	-----	-----	3	7	8	2	1

	Eye and interorbital in percent of length							
	Eye				Interorbital			
	5.5	6.0	6.5	7.0	8.0	8.5	9.0	9.5
ericymba	7	---------	---------	---------	---------	2	1	4
peruana	3	8	7	2	5	11	3	---------

	Second anal spine in percent of length																							
	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5	21	21.5	22	22.5	23	23.5	24
ericymba	1	--	----	1	1	1	2	--	----	--	1	--	----	--	----	--	----	--	----	--	----	--	----	--
peruana	----	--	----	--	----	2	1	--	----	--	----	--	1	--	2	1	----	3	4	2	----	1	1	1

	Third dorsal spine in percent of length															
	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19
ericymba	2	1	------	----	------	1	1	----	1	----	------	----	----	----	----	----
peruana	----	----	------	----	------	----	------	2	------	----	2	1	1	----	2	1

Range.—Stellifer ericymba has been recorded only from Panama Bay. The range, as represented by the new southern subspecies, *peruana*, is now known to extend to northern Peru.

STELLIFER MINOR (Tschudi)

MOJARRILLA

FIGURE 67

Corvina minor TSCHUDI, 1845, p. 9, Lima market, Peru (original description).

Corvina agassizii STEINDACHNER, 1875a, p. 26, Callao and Paita, Peru, and Caldera, Chile (original description).—COPE, 1877, p. 26, Pacasmayo and Chimbote, Peru.

Stelliferus minor JORDAN and EIGENMANN, 1889, pp. 391, 393, Callao, Peru (diagnosis; range; *agassizii* synonymized).

Stellifer minor ABBOTT, 1899, p. 354, Callao, Peru.—STARKS, 1906, p. 793, Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 99, pl. 9, fig. 2, Pacasmayo and Chimbote, Peru (synonymy; description; range; relationship).—NICHOLS and MURPHY, 1922, p. 510, Pacasmayo.

Head 3.33; depth 2.75; D. XII–I, 20; A. II, 10; P. 18; scales 54. Body rather deep, compressed, its greatest thickness scarcely half its depth; back thin, elevated; outline straight over eyes, moderately convex from posterior margin of eyes to origin of dorsal; head deep, compressed, the bones not excessively cavernous; caudal peduncle strongly compressed, 3.0 in head; snout blunt, not extending beyond premaxillaries, 3.9 in head; eye moderate, round, 4.6; interorbital 2.9; mouth oblique, nearly terminal; lower jaw included; maxillary reaching about under middle of eye, 2.6 in head; teeth in each jaw in a band, the outer ones in upper jaw slightly enlarged; preopercle with serrate margin, the 2 spines at angle enlarged, the lowermost one directed downward; gill rakers slender, the ones at angle about three-fourths length of eye, 23 on lower and 13 on upper limb of first arch (not 6, as stated by Evermann and Radcliffe, 1917, p. 100); lateral line with a long arch, becoming horizontal over origin of anal; scales firm, ctenoid, becoming smooth on head, but not on chest, extending on second dorsal, caudal, and anal, but not covering entire fins, extending slightly on bases of pectoral and ventral, none on first dorsal, the rows above lateral line more or less parallel with it, 7 rows between it and first dorsal spine; dorsal fins slightly connected, the spines low, stronger than in related species, the second one not stronger or much shorter than the third, the fourth longest and not reaching beyond tip of succeeding spines, if deflexed, 2.0 in head; second dorsal highest anteriorly, the longest rays fully as long as the longest spines; caudal injured in the specimen at hand, described as "subtruncate" (Evermann and Radcliffe, 1917, p. 100); second anal spine moderately slender, notably shorter than longest soft rays, 2.6 in head; ventral inserted just behind base of pectoral, 1.5 in head without filament; pectoral long, pointed, reaching well beyond tip of ventral, as long as head, 3.33 in length.

Color of old preserved specimen brown above; this color shading into the pale color of the lower parts; definite dark lines along the rows of scales, most prominent on middle of side; opercle with a dark blotch; vertical fins dusky; margin of spinous dorsal quite dark; paired fins lighter; base of pectoral on inner side dusky.

The description is based on a single specimen with a somewhat damaged caudal fin, about 150 mm. (130 mm. to base of caudal) long, taken by R. E. Coker at Pacasmayo. Although this species has been reported as common in the vicinity about Callao, and at Pacasmayo, the Mission did not obtain specimens. The deep body, the strong, short dorsal spines, short anal spine, and the hard, firm scales, with rather prominent dark lines marking their course, aid in distinguishing this species from other local forms. The specimen described is in excellent agreement with Steindachner's description of *agassizii* but not in some respect with Tschudi's description of *minor*. In the absence of specimens for determining individual variations, I follow Jordan and Eigenmann and others in placing *agassizii* in the synonymy of *minor*.

Range.—Coasts of Peru and Chile.

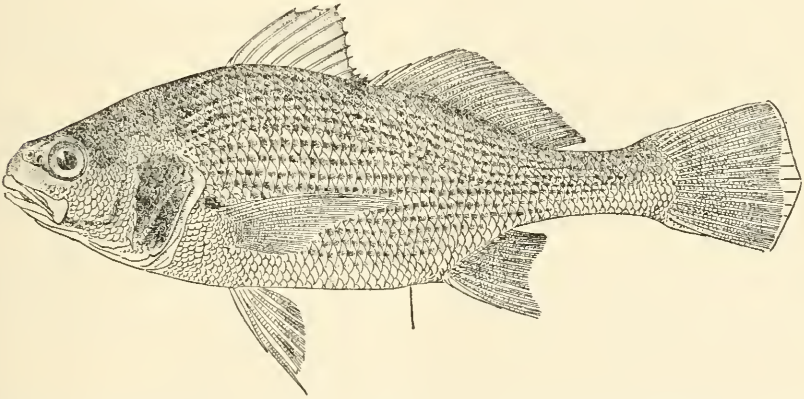

FIGURE 67.—*Stellifer minor* (Tschudi). From a specimen 150 mm. long, Pacasmayo, Peru (U.S.N.M. No. 77669). (After Evermann and Radcliffe, 1917.)

Genus NEBRIS Cuvier and Valenciennes, 1830

Body quite elongate, tapering posteriorly; head broad, little compressed, the bones very cavernous (spongy to the touch); eye very small; slits and pores about the mouth little developed; mouth large, oblique; lower jaw projecting; teeth small, subequal, in a few series or in a band in each jaw; preopercle with a membranous border; gill rakers moderately long; scales small, mostly cycloid, extending on all the fins.

A single species is known from the Pacific coast of America. The genus had not previously been reported from the coast south of Panama Bay.

NEBRIS OCCIDENTALIS Vaillant

Nebris occidentalis Vaillant, 1897, p. 124, Pacific coast of Central America (original description).—Meek and Hildebrand, 1925, p. 681, Panama Bay (synonymy; description; range).

Head 2.8 to 3.7; depth 4.0 to 4.8; D. VIII or IX–I, 28 or 29; A. II, 11 or 12; P. 19 or 20; scales about 100 to 116 (too small and uneven to enumerate accurately).

Body elongate, tapering sharply posteriorly, somewhat compressed; back rather broad, little elevated; head rather low, somewhat compressed (more so in small specimens than in large ones); caudal slender, 3.7 to 5.7 in head; snout 3.5 to 3.6; eye 8.5 to 10; interorbital 3.0 to 3.33; mouth large, very strongly oblique; lower jaw projecting; maxillary reaching to or somewhat past middle of eye, 2.1 to 2.2 in head; teeth small, in a band laterally in upper jaw, reduced to 1 or 2 series anteriorly, widely separated medianly, those of lower jaw principally in two irregular series; preopercle with a slightly crenulate, membranous border; gill rakers at angle fully as long as eye, 13 or 14 on lower and 6 or 7 on upper limb of first arch; lateral line not arched, becoming horizontal about over origin of anal; scales small, cycloid, those on head larger than the ones on body, many of the scales in lateral line with accessory scales, densely covering all the fins; dorsal fins connected by membrane, at least in young, the spines very weak, flexible, the third and fourth of about equal length, about 2.75 in head; second dorsal highest anteriorly, its longest rays somewhat shorter than the longest spines; caudal lanceolate, especially in small specimens, the middle rays as long as head in young, proportionately much shorter in large examples; anal small, the spines very weak; ventral inserted under or slightly in advance of pectoral, 1.6 to 1.75 in head; pectoral very large, reaching far beyond tip of ventral, somewhat damaged, about 1.25 in head, and 4.5 in length.

Color grayish brown above; silvery below; fins mostly more or less olivaceous; first dorsal distally dusky; second dorsal with a somewhat dusky margin; caudal, pectoral, and sometimes ventral dusky toward tips.

Six specimens, consisting of one large one, 395 mm. (330 mm. to base of caudal) long, and five small ones 135 to 190 mm. (102 to 150 mm. to base of caudal) long, were secured by the Mission in the Gulf of Guayaquil, off Puerto Pizarro; all taken in an otter trawl. Most of the specimens are not in good condition. They were compared with material from Panama Bay with which they are in agreement. The head and body are more compressed in the young, the caudal peduncle is slenderer, and the caudal fin is longer and more strongly lanceolate.

Range.—Previously recorded from the west coast of Central America south to Panama Bay. The range now is known to extend as far south as northern Peru.

Family MULLIDAE: Goatfishes

Body elongate, compressed; head deep, its upper profile strongly convex; eye placed high; mouth low, more or less terminal; premaxillaries protractile; maxillary thin, very broad; branchiostegals 4; pseudobranchiae present; gills 4; two long, unbranched barbels attached just behind anterior rim of lower jaw; teeth mostly small, variously placed; lateral line complete, the pores branched; scales large, usually ctenoid, extending forward on head; dorsal fins 2, far apart, the first with six to eight spines; anal short, similar to second dorsal, with one or two spines; ventrals thoracic, with I, 5 rays.

A single genus comes within the scope of the present work.

Genus PSEUDUPENEUS Bleeker, 1862

Teeth in the upper jaw uniserial, except in large specimens which have an extra row on the outside of the main series anteriorly. Lower jaw with one or two series of teeth anteriorly and a single series laterally.[19] Vomerine and palatine teeth wanting. Other characters of the genus are sufficiently shown in the family description.

A single species is included in the collections from Peru.

PSEUDUPENEUS GRANDISQUAMIS (Gill)

Upeneus grandisquamis GILL, 1863c, p. 168, west coast of Central America (original description).—JORDAN and EVERMANN, 1896, p. 860 (description; range; synonymy).—MEEK and HILDEBRAND, 1923, p. 305, Panama Bay (synonymy; description; range).

Head 3.3, 3.45; depth 3.4, 3.65; D. VIII–I, 8; A. II, 6; P. 16; scales 2–18, 2–27.

Body rather strongly compressed, its greatest thickness about half its depth; dorsal profile anteriorly strongly convex; ventral profile nearly straight; caudal peduncle rather deep, compressed, its depth 2.6, 2.7 in head; head rather short, deep; snout rather blunt, 2.5, 2.6 in head; eye placed very high, 3.9, 4.15; interorbital slightly convex, 4.1, 4.3; mouth rather small, nearly horizontal; maxillary expanded, thin, membranous posteriorly, 3.0, 3.1, in head; teeth in upper jaw in a single series (in 2 series in large specimens), pointed, in 2 irregular series anteriorly in lower jaw, in a single series laterally, none on vomer or palatines; upper limb of opercle with one rather strong spine and a weak point above it; preopercular margin smooth; gill membranes somewhat connected across isthmus; gill rakers slender, 5, 6 on upper and 18, 20 on lower limb, including rudiments; lateral line complete, following curvature of the back, the pores branched; scales large, finely ctenoid, extending forward on head, cheeks, and opercles; first dorsal composed of flexible spines, rather high anteriorly, longest spine 1.3, 1.4 in head, origin of fin over base of pectoral; second dorsal well separated from the first, its orignal nearly equidistant from posterior margin of eye and base of caudal, its margin convex, the last ray somewhat longer than the preceding one; caudal deeply forked; anal small, its origin scarcely behind that of second dorsal, its base 2.25, 2.6 in head; ventral nearly as long as pectoral; pectoral long, narrow, 1.2, 1.25 in head.

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[19] Some modification of the description of the teeth as given by Longley (*in* Longley and Hildebrand, 1941, p. 141) was made so that the genus *Pseudupeneus* might include the species herein described, which heretofore has rested in the genus *Upeneus*. Dr. Longley found that only those species having vomerine and palatine teeth could properly be assigned to *Upeneus*.

Color nearly uniformly grayish above; pale below; the smaller specimens with indefinite dark blotches along back; dorsal and caudal fins more or less dusky; other fins pale. Body largely rose-red in life.

The Mission secured two specimens, 80 and 95 mm. (62 and 73 mm. to base of caudal) long, in Chilca Bay, upon which the foregoing description is based. The family apparently had not previously been reported from Peru.

The specimens in the collection were compared with several of equal size and larger ones from Panama Bay, and one 220 mm. long (U.S.N.M. No. 41475), from Chatham Island, Galápagos. The larger specimens differ from the smaller ones in having a proportionately deeper body, and in having two instead of one row of teeth anteriorly in the upper jaw. The additional row is composed of blunt stocky teeth on the outside of the main row. These teeth do not appear when the fish reach any definite size, but seem to develop at rather various sizes. For example, a specimen 145 mm. long already has the second series, whereas another one 185 mm. long still has only a single series.

Range.—Gulf of California to northern Peru. Now recorded from Peru and the Galápagos Islands for the first time.

Family SPARIDAE: Porgies

Body oblong or ovate, usually rather strongly compressed; back sometimes rather high; mouth small or of moderate size, usually nearly or quite horizontal; maxillary slipping under preorbital for most of its length, with a supplemental bone; preorbital usually very broad; teeth strong, those in anterior part of jaws conical, incisorlike or molarlike, those at sides blunt molars; no teeth on vomer or palatines; gills 4, a slit behind the fourth; gill rakers small or obsolete; opercle without spine; lateral line complete, not extending on caudal fin, following outline of back; scales rather large and firm; dorsal fin long, continuous, the spines rather large, about 10 to 13 in number; caudal usually well forked; ventral fins thoracic.

A single genus has been reported from Peru.

Genus CALAMUS Swainson, 1839

Body rather deep, compressed; back elevated; head compressed; preorbital broad; mouth small to moderate, more or less horizontal; outer teeth in anterior part of jaws more or less enlarged, conical or pointed, those at side and behind consisting of low broad molars; preopercle entire; gill rakers few, very short and broad; posterior nostril an elongate slit; dorsal fin continuous, little indented; caudal forked; anal with three rather short spines, the second not especially enlarged; pectoral long.

Two species seem to belong to the Peruvian fauna.

KEY TO THE SPECIES

a. Anal with about 10 soft rays; 6 complete rows of scales between the lateral line and first dorsal spine; mouth moderately small, the maxillary 2.9 in head in adults; outer teeth in anterior part of jaws not very large, posterior molarial teeth in 3 rows in upper jaw and 2 in lower jaw. **brachysomus** (p. 313)

aa. Anal with about 9 soft rays; 5 complete rows of scales between lateral line and first dorsal spine; mouth rather large, the maxillary 2.1 to 2.25 in head; outer teeth in anterior part of jaws quite long, slender, posterior molarial teeth in 2 rows in each jaw---------------- **taurinus** (p. 314)

CALAMUS BRACHYSOMUS (Lockington)

MAROTILLA

Sparus brachysomus LOCKINGTON, 1880, p. 284, Magdalena Bay, Baja California (original description).

Calamus brachysomus MEEK and HILDEBRAND, 1925, p. 574, Panama Bay (synonymy; description; range).

Head 2.9, 3.15, 3.1; depth 2.25, 2.2, 2.1; D. XII, 11, XII, 12, XII, 12; A. III, 10, III, 10, III, 10; P. 15, 15, 15; scales 46, 48, 48.

Body deep, rather strongly compressed, its greatest thickness only about a third of its depth; back high; dorsal profile strongly convex in front of dorsal; caudal peduncle slender, 3.2, 2.9, 3.4 in head; snout increasing in length with age, 3.2, 3.3, 2.0; eye 2.4, 2.8, 3.7; interorbital somewhat expanded, 4.5, 4.9, 4.0; preorbital increasing greatly in width with age, about half diameter of eye in a specimen 45 mm. long, exceeding diameter of eye in one 180 mm. long; mouth rather small; lower jaw included; maxillary slipping partly under preorbital, 3.6, 2.8, 2.9 in head; teeth in anterior part of each jaw pointed, in a band, the outer ones considerably enlarged, becoming very broad and blunt, molarial laterally, upper jaw with three rows posteriorly, lower jaw with two, the teeth of inner row in each jaw largest; gill rakers short, 5, 5, 6 on lower and 3, 3, 3 on the upper limb of first arch; lateral line not fully concurrent with outline of back; scales finely ctenoid, extending forward on head to interorbital, forming a sheath on base of soft part of dorsal and anal, extending somewhat on bases of caudal, ventral, and pectoral, six complete rows between lateral line and first dorsal spine, five oblique series on cheek; spinous part of dorsal notably longer than soft part, third or fourth dorsal spine longest, 2.4, 1.8, 2.3 in head; caudal rather deeply forked, the lobes pointed, the upper one longest; anal spines moderately strong, the second a little longer than the third, though not reaching beyond its tip if deflexed, 2.6, 2.8, 3.4, the soft part similar to that of dorsal, though somewhat lower, coterminal with it; ventral inserted a little behind base of pectoral, with a moderately strong spine contained 2.0, 1.8, 2.3 in head; pectoral long, especially in adult, equal to or a little shorter than head in small specimens, longer than head in adult, 3.5, 3.1, 2.8 in length.

Color grayish above, silvery below; side with seven dark cross bars, distinct in small specimens, less so in the largest one (disappearing with age according to Panama specimens), the first and broadest bar extending from nape across eye and cheek, second bar somewhat in front of dorsal, and extending down on side behind base of pectoral, next four all under base of dorsal and all of about equal width and equally spaced; last bar on caudal peduncle; opercle slightly blotched with dusky; pectoral with a small dark spot at base of upper ray, the fin otherwise plain translucent; other fins with dark spots and blotches, forming indefinite bars on the caudal (these fins becoming quite plain in large specimens from Panama).

This species, which is new to Peru, is described here from three specimens, respectively 30, 45, and 180 mm. (23, 35, and 135 mm. to base of caudal) long, collected by the Mission at Lobos de Tierra Island and in Independencia Bay at Lagunilla. The proportions and enumerations are given in order of size, beginning with the smallest one. The specimens seem to agree with examples from Panama Bay and the Gulf of California, with which they were compared. The species probably is not numerous, though apparently known to local fishermen, as the collectors furnished a name for the largest specimen taken at Lobos de Tierra Island.

Range.—Gulf of California to Peru. Previously reported from only as far south as Guayaquil, Ecuador.

CALAMUS TAURINUS (Jenyns)

Chrysophrys taurina Jenyns, 1842, p. 56, pl. 12, Galápagos Islands (original description).

Calamus taurinus Jordan and Evermann, 1898, p. 1354, Paita, Peru (description; range; synonymy).

Head 2.9, 2.34; depth 2.3, 2.35; D. XII, 11, XII, 11; A. III, 9, III; 9; P. 15, 14; scales 47, 46.

Body very deep, compressed, its greatest thickness only about a third its depth; back high; profile from snout to nape gently convex;

ventral outline little convex anteriorly; head deep, compressed, swollen in front of eyes; caudal peduncle compressed, rather slender, 3.6, 3.6 in head; snout long, 1.6, 1.7; eye 4.0, 4.6; interorbital 4.1, 3.7; suborbital very broad, 2.4, 2.3; mouth placed low, terminal, nearly horizontal; maxillary scarcely reaching vertical from front of eye, 2.1, 2.25 in head; jaws anteriorly each with six to eight slender canines, with a patch of smaller pointed teeth behind them, a double row of very strong, low blunt teeth in each jaw inside and posterior to the front teeth; gill rakers very short, broad, about six somewhat developed on lower and three on upper limb of first arch; scales rather large, cycloid or at most very weakly ctenoid, the rows above lateral line parallel with it, five rows between it and base of first dorsal, and only three at base of first soft ray of dorsal, five vertical rows on cheek, scales forming a low sheath at base of soft dorsal and anal, and extending on caudal, and somewhat on base of pectoral; dorsal fin continuous, the fourth spine longest, 2.6, 2.0 in head; caudal forked, the upper lobe longest; anal small, the spines moderately slender, the second about as long as the third, but no stronger, apparently variable in length, 4.8, 3.8 in head; ventral inserted well behind base of pectoral, with a very long pointed axillary scale, and with a slender spine, 2.7, 1.9 in head; pectoral long, the fourth ray (counting downward) produced, longer than head, 2.8 to 3.0 in length.

Color of the old preserved specimens at hand plain grayish brown to yellowish straw color below; scaleless part of head rather dark brown; membranous margin of opercle dark; axil of pectoral dark; fins otherwise about of same color as body. The specimen described from Paita by Jordan and Evermann (see reference above) had faint dark cross bands.

This species is included solely on the record by Jordan and Evermann (see reference above), who reported a specimen from Paita, Peru, but failed to state in which institution the specimen is preserved. This species has not been taken by recent collectors in Peru. It is here described from two specimens (U.S.N.M. Nos. 50080, 50081) from South Seymour Island, Galápagos, respectively 385 and 340 mm. (298 and 257 mm. to base of caudal) long. In the description the proportions and enumerations based on the smaller specimen in each instance are given first.

Range.—Galápagos Islands and Paita, Peru.

Family KYPHOSIDAE: Rudderfishes

Body elongate or ovate, compressed; head short, blunt; mouth moderate or small; outer teeth in jaws more or less incisorlike, frequently movable, no molars, teeth present or absent on vomer and palatines; gills 4; scales small or moderate, usually present on entire body except snout; dorsal fin continuous, with 10 to 15 spines; anal with 3 rather short spines; ventral thoracic, with 1 spine and 5 soft rays.

A single genus is represented among the Peruvian collections studied. The species of this family are herbivorous, feeding largely on algae. As usual in herbivorous fishes, the intestinal canal is long.

Genus **DOYDIXODON** Valenciennes, 1855

Body rather deep, moderately compressed; head short, blunt; mouth small; jaws with an outer band of enlarged movable teeth, arranged in oblique rows meeting on median line of each jaw, each tooth with a narrow basal support and with an expanded bicuspid or tricuspid, or entire edge, generally spoon-shaped, a band of minute teeth behind the outer ones; scales extending more or less on the fins, but not covering any fin entirely; dorsal with 12 or 13 spines and 15 to 18 soft rays.

A single species is recognized herein. However, when a larger series of specimens, including a wider range in size, becomes available, it may become necessary to recognize two or more species.

DOYDIXODON LAEVIFRONS (Tschudi)

BABUNCO; GALLINAZO

FIGURE 68

Pimelepterus laevifrons TSCHUDI, 1845, p. 18, Huacho, Peru (original description).
Doydixodon laevifrons JORDAN and FESLER, 1893, p. 532 (original description quoted).—STARKS, 1906, p. 792, pl. 66, fig. 2, Mollendo, Peru (this species and *D. freminvillei* compared; both species illustrated).—EVERMANN and RADCLIFFE, 1917, p. 94, Lobos de Afuera and Mollendo, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 509, Chincha and Ballestas Islands, Peru.

Head 3.2 to 3.6; depth 2.2 to 2.4; D. XII or XIII, 15 or 16; A. III, 12 or 13; P. 18; scales 52 to 55.

Body deep, moderately robust, its greatest thickness somewhat less than half its depth; back fairly high; profile anteriorly rather strongly convex; head short and deep; caudal peduncle long, 1.75 to 1.85 in head; snout rather blunt, 2.3 to 2.5 in head; eye small, 4.6 to 5.0; interorbital 2.25 to 2.6; mouth small, slightly inferior; upper lip broad; maxillary reaching somewhat beyond front of eye, 2.5 to 2.8 in head; teeth anteriorly in each jaw in 3 or 4 oblique rows, meeting at midline of jaw, each tooth with a narrow basal stalk, and expanded distally, more or less spoon-shaped, distally rounded, square or slightly notched, a band of minute teeth in each jaw behind the outer teeth and well separated from them; preopercle entire; opercle ending in a broad flat point; gill rakers about as long as pupil, 18 or 19 on lower and about 12 on the upper limb of first arch; scales with slightly crenulate, membranous edge, reduced anteriorly above lateral line, and on chest and abdomen, extending more or less on the fins; dorsal spines low, slightly graduated, but not increasing much in length after the fourth or fifth, soft part anteriorly much higher, with concave margin, longest rays 1.4 to 1.5 in head; caudal concave, the lobes pointed, upper one the longer, anal spines short, graduated, the soft part anteriorly rather high, with concave margin, the longest rays 1.25 to 1.3 in head; ventral inserted well behind base of pectoral, its spine closely attached to first ray, contained 3.1 to 3.5 in head; pectoral broad, with obliquely rounded margin, not quite reaching tip of ventral, 3.8 to 4.3 in length, 1.2 in head.

Color in alcohol grayish brown; membranes of spinous dorsal blackish.

The foregoing description is based on three specimens 300, 310, and 370 mm. (233, 253, and 295 mm.) long. Two of these were secured by R. E. Coker, one at Lobos de Afuera and the other at Mollendo. The third was taken by the Mission in a trammel net in San Juan Bay. In addition to the large specimens listed, there are at hand eight juveniles 25 to 38 mm. (19 to 29 mm. to base of caudal) long, taken in Independencia Bay, by W. L. Schmitt; also five specimens from "Peru" collected by the Wilkes Exploring Expedition, which belong to this genus and possibly this species. If so, considerable allowance for changes with age must be made, for the outer teeth in the jaws of these young are bicuspid and tricuspid, and the scales ctenoid, and have only about 8 or 9 radii on the basal half, whereas those of the large specimens have about 40. In the number of dorsal, anal, and pectoral rays, in the number of scales, and in gill rakers they agree with the large specimens. The proportions, when the great difference in size is considered, also are in fair agreement. The following proportions and enumerations are based on five juveniles, 19 to 47 mm.

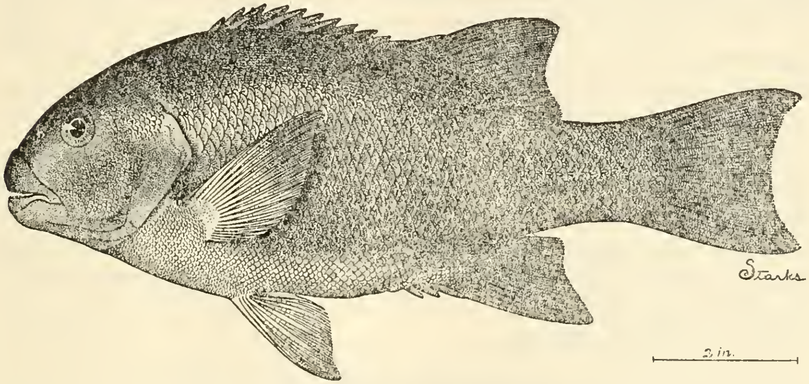

Figure 68.—*Doydixodon laevifrons* (Tschudi). From a specimen 270 mm. long, Mollendo Peru. (After Starks, 1906.)

long to base of caudal: Head 3.1 to 3.2; depth 2.75 to 2.9; pectoral 4.25 to 4.4. Eye in head 3.0 to 3.6; snout 3.3 to 4.2; interorbital 3.5 to 4.5; maxillary 3.3 to 3.6; longest dorsal ray 1.75 to 1.85; longest anal ray 1.5 to 1.6; pectoral 1.3 to 1.4. D. XII, 14 to 16; A. III, 12; P. 18 or 19; scales 49 to 53; gill rakers 12+18.

That there are at least two species of this genus on the mainland of South America seems evident from the description of "*Doydixodon laevifrons*" by Steindachner (1898, p. 289), based on a specimen 290 mm. long, taken at Iquique, Chile. This description seems to suit specimens (U.S.N.M. No. 50027) from the Galápagos Islands, apparently correctly identified as *D. freminvillei*, a name that Steindachner synonymized with *D. laevifrons*. However, the Galápagos Islands specimens certainly are different, as the anterior profile is much more strongly convex, the teeth are more truly spoon-shaped, the bowl being nearly at right angles, rather than at an angle of about 20° to 30°, to the basal supports, the gill rakers apparently are more numerous, with about 25 on the lower limb of the first arch, and the anterior lobes of the soft parts of dorsal and of anal are much lower, and the margins instead of being concave are convex.

D. fasciatum Kner and Steindachner, originally described from small specimens taken at Iquique, Chile, generally has been synonymized with *D. laevifrons*, or with *D. freminvillei*. The young now at hand from Peru and from the Galápagos Islands are all uniform in color, being entirely without stripes or bars. Therefore, *D. fasciatum*, after all, may be a valid species.

Range.—Coast of Peru.

Family EPHIPPIDAE: Spadefishes

Body short and very deep, strongly compressed; back much elevated; head short, blunt; mouth small, terminal, protractile or not; teeth slender, flexible; nostrils double; gills 4, the membranes broadly united with the isthmus; lateral line complete, strongly arched; scales small, ctenoid, covering entire body, and extending at least on the vertical fins, exclusive of spinous dorsal, in the adult, dorsal fins nearly or quite connected, with 8 to 10 spines, soft part large, anteriorly elevated in adult; anal with 3 spines, the soft part similar to that of soft dorsal; ventral thoracic; pectoral short.

This family is represented in American waters by two genera, only one of which, *Chaetodipterus*, is now definitely known to occur in Peru. However, there are at least three specimens of the other genus, *Parapsettus*, in the U. S. National Museum, taken at Guayaquil, Ecuador. Therefore this genus may be expected in northern Peru. It is readily distinguishable from *Chaetodipterus* by the very short dorsal spines, which are all of about equal length and scarcely longer than the pupil. The premaxillaries are not protractile, the skin of the forehead being continuous with the upper lip; and the ventral fins are small, not reaching the vent.

Genus CHAETODIPTERUS Lacepède, 1802

Mouth small, with flexible teeth in narrow bands in each jaw; premaxillaries somewhat protractile; preopercle finely serrate to nearly smooth; dorsal spines of unequal length, the third one notably longer than the others; ventral fins large, generally reaching to, or beyond, vent.

One species, new to the fauna of Peru, is included in the collections studied. This genus has one representative on the Atlantic and one on the Pacific coast of America. The two differ principally in the size and arrangement of the scales on the body, the Atlantic coast species, *faber*, having notably larger scales, which are arranged in more regular series.

CHAETODIPTERUS ZONATUS (Girard)

Ephippus zonatus GIRARD, 1858, p. 110, San Diego, Calif. (original description; reported to differ from *faber* of the Atlantic "by the outline of the vertical fins chiefly," a character that varies with age and probably is of no diagnostic value).

Chaetodipterus zonatus MEEK and HILDEBRAND, 1928, p. 762, pl. 76 (synonymy; description; compared with *faber* from the Atlantic; range).

Head 3.0; depth 1.2; D. VIII–I, 24; A. III, 19; P. 16; scales in irregular series, about 83.

Body deep, strongly compressed, its greatest thickness about 4.5 in its depth; dorsal profile anteriorly steep, but not vertical, convex over snout, nearly straight from interorbital to nape; caudal peduncle short, strongly compressed, 2.15 in head; snout very blunt, 2.8; eye 3.45; interorbital 2.9; mouth small, terminal; maxillary failing to reach vertical from anterior margin of eye, 3.25 in head; teeth slender, flexible, in a narrow band in each jaw; preopercle slightly serrate; lateral line strongly arched, reaching middle of side only on caudal peduncle; scales small, strongly ctenoid, covering entire body, and extending on all the vertical fins exclusive of spinous dorsal; dorsal fins not entirely separate, the third spine much enlarged, about as long as head, 3.0 in length; soft dorsal with broadly convex margin, the longest rays only a little shorter than the longest dorsal spine; caudal with a nearly straight margin; anal somewhat similar to second dorsal, but higher and angulate anteriorly, its longest rays about as long as head, the spines rather strong, the second the longest, 2.0 in head; ventral long, reaching beyond origin of anal, the first soft ray bearing a filament, the spine strong, 1.75 in head; pectoral somewhat pointed, 1.15 in head, 3.4 in length.

Color brownish, with a slight silvery sheen, especially on lower part of side; sides with five dark vertical bars, and with a suggestion of a sixth one at base of caudal, the first one crossing eye, the second crossing base of pectoral, the third narrower than the others, extending down from fourth dorsal spine and disappearing behind base of pectoral; the fourth extending from posterior spines of dorsal to base of anterior rays of anal; and the fifth extending from near midlle of soft dorsal to somewhat posterior to middle of anal; dorsals and anal brownish, with dark margins; caudal brownish at base, rest of fin plain translucent; ventral very dark brown; pectoral brownish at base, the rest of fin plain translucent.

The description is based on a small specimen, 68 mm. (52 mm. to base of caudal) long, dredged near Sechura by the Mission. As far as known, this is the first and only representative of the genus taken in Peruvian waters. This fish agrees well with a specimen from Guayaquil, and several from Panama Bay and the west coast of Central America and Mexico with which it was compared. In large individuals the interorbital becomes considerably expanded, the scales cover all the fins, and the anterior rays of the second dorsal, as well as those of the anal become greatly produced, and the outer rays of the caudal become elongate, making the margin of the fin concave.

Range.—California to northern Peru. Previously reported from only as far south as Guayaquil, Ecuador.

Family CHAETODONTIDAE: Butterflyfishes

Body short and deep, usually strongly compressed; head short, mouth small, terminal; premaxillaries protractile; teeth bristlelike, in a band in each jaw, none on vomer or palatines; gills 4, the rakers short or obsolete, the membranes united with the isthmus; pseudobranchiae large; scales rather small, ctenoid; lateral line more or less concurrent with the back; dorsal fin single, the soft part often elevated anteriorly, generally densely covered with scales; anal with 3 or 4 spines, the soft part usually similar to that of dorsal; ventral thoracic, with I, 5 rays.

A single genus and species, new to the fauna of Peru, comes within the scope of the present work.

Genus CHAETODON Linnaeus, 1758

Body ovate, strongly compressed; snout more or less pointed; mouth very small, terminal; teeth in jaws small, flexible, numerous, in bands; preopercle without an enlarged spine; lateral line arched; scales firm, ctenoid, about 30 to 50 in a lateral series; dorsal fin long, continuous, with about 11 to 15 spines, the anterior ones longer than some of the posterior ones; soft part rather low, with about 18 to 21 rays; caudal with a more or less straight to round margin; anal with 3 or 4 strong spines, the soft part similar to that of dorsal, though generally with somewhat fewer rays.

A single species, new to the fauna of Peru, is included in the collections studied.

CHAETODON HUMERALIS Günther

Chaetodon humeralis Günther, 1860, p. 19, "Sandwich Islands," regarded as an error; Panama Bay has been suggested as the correct locality (original description).—Meek and Hildebrand, 1928, p. 770, Panama Bay (synonymy; description; range).

Head 2.65 to 2.75; depth 1.3 to 1.35; D. XIII, 20; A. III, 16 or 17; P. 16; scales along middle of side 33 to 35.

Body very strongly compressed, its greatest thickness about a fourth of its depth; back much elevated; dorsal profile concave over the head; caudal peduncle short, very strongly compressed, 2.7 to 3.0 in head; snout rather pointed, 3.1 to 3.2 in head; eye 2.7 to 3.2; interorbital somewhat expanded, 3.5 to 3.9; mouth very small, terminal; maxillary reaching nearly to vertical from anterior nostril, 4.15 to 4.4 in head; teeth very fine, in a broad band in each jaw, arranged more or less in series; lateral line strongly arched, ending under posterior rays of dorsal; scales ctenoid, much reduced on head, covering most of soft parts of dorsal and anal, also extending more or less on bases of caudal, ventral, and pectoral, the rows running obliquely upward and backward on side, becoming nearly horizontal on lower parts, seven full rows between lateral line and base of first dorsal spine; dorsal fin continuous, not definitely indented, the third and fourth spines longest, 1.3 in head; soft part of dorsal with round margin, longest rays higher than posterior spines, but shorter than the longest spines; caudal with nearly straight margin; anal with strong spines, the second longer and stronger than the third, 1.8 to 1.95 in head, soft part similar to that of dorsal and coterminal with it; ventral large, reaching origin of anal, its spine strong, 1.5 to 1.75 in head; pectoral moderately long, 1.1 to 1.25 in head, 3.0 to 3.3 in length.

General color light silvery brown; rows of scales marked with dark lines; tip of snout black; a dark band, narrower than eye, extending from nape across eye to lower margin of opercle; a broader dark band extending from first three dorsal spines across and somewhat below base of pectoral; a still broader dark band reaching from the last few dorsal spines and first soft rays of dorsal to anal spines; a narrow dark band at base of caudal, and a very narrow one on caudal fin; a dark intramarginal band on soft dorsal and anal, these fins, as well as the caudal and pectoral, otherwise plain translucent; ventral largely dusky.

The description is based on three specimens, respectively 42, 43, and 60 mm. (33, 33, and 49 mm. to base of caudal) long. These specimens, the first of this species to be reported from Peru, were collected by the Mission in Lobos de Tierra Bay, and in Chimbote Bay. They seem to agree perfectly with specimens of similar size from Panama Bay.

Range.—Gulf of California to northern Peru. Previously recorded from only as far south as Panama Bay.

Family OPLEGNATHIDAE

Body short and deep, rather strongly compressed; mouth small; teeth fused, forming a continuous plate (beak) in each jaw, each plate with a median suture; premaxillaries not protractile; maxillary not concealed under preorbital; nostrils paired; gills 4, a slit behind the fourth; gill membranes broadly united, free from the isthmus; gill rakers short, about 12 on lower limb of first arch; lateral line single, complete; scales small, ctenoid, extending at least on bases of the vertical fins; dorsal fin continuous, composed of about 10 to 13 spines and 11 to 20 soft rays; anal with 3 spines, soft part like that of dorsal, though frequently shorter; ventrals thoracic, with 1 spine and 5 soft rays.

A single genus, known from South Africa, Australia, Japan, and Peru, is recognized.

Genus OPLEGNATHUS Richardson, 1840

The characters of the genus are those of the family. It has no near relatives. A single species is known from American waters.

OPLEGNATHUS INSIGNIS (Kner)

Loro; Lorito; Perico

Scarostoma insigne Kner, 1867, p. 715, pl. 2, west coast of South America (original description).

Hoplognathus insignis Regan, 1913, p. 279, Lobos de Tierra, Peru.

Oplegnathus insignis Evermann and Radcliffe, 1917, p. 109, Lobos de Afuera and Paita, Peru (synonymy; description; compared with *O. fasciatus*).—Nichols and Murphy, 1922, p. 510, North, South, and Central Chincha Islands (size attained; habitat).

Head 2.8 to 3.1; depth 1.6 to 2.1; D. XI, 17; A. III, 12 to 13; P. 16 or 17; scales too small and irregular to enumerate accurately, about 115 to 130.

Body short and deep, strongly compressed, its greatest thickness about 3.0 to 3.5 in its depth; caudal peduncle short and deep, 2.1 to 2.5 in head; snout pointed, 2.2 to 2.6 (4.2 in a juvenile) in head; eye 4.8 to 6.1 (3.33 in a juvenile); interorbital 3.1 to 3.6 (4.2 in a juvenile); mouth rather small; maxillary reaching nearly or quite to front of eye, 2.6 to 3.2 in head (3.6 in a juvenile); teeth fused, forming a continuous plate (beak), with a median suture; margin of preopercle finely serrate;

gill rakers at angle scarcely as long as pupil, 12 on lower and 5 on upper limb of first arch; lateral line strongly arched, becoming horizontal over posterior rays of anal; scales very small, firm, strongly ctenoid, extending forward on interorbital and on all the vertical fins, exclusive of the spinous part of dorsal, and slightly on base of pectoral; dorsal fin continuous, the fifth or sixth spine highest, 2.1 to 3.2 in head, soft part much higher, the longest rays nearly twice the length of the longest spines, its margin nearly straight, the lobe anteriorly rounded; caudal slightly concave, the upper lobe slightly the longer; anal fin similar to soft part of dorsal, though somewhat shorter, the spines moderately well developed, the second longest, 3.25 to 5.8 in head; ventral inserted behind base of pectoral, rather broad, the second and third rays longest, 1.1 to 1.5 in head; pectoral broadly rounded, not quite reaching tip of ventral, 1.25 to 1.3 in head, 3.6 to 4.0 in length.

Color of a specimen 210 mm. long pale yellow, with six very dark (nearly black) bars, nearly or quite encircling the body; the first across eye, forming a V with its fellow at nape; the second broader than the first, crossing back in front of dorsal, and bases of pectoral and ventral; the third still broader, lying under middle of spinous part of dorsal; the fourth of about same width as the third, crossing body between anterior half of soft part of dorsal and anterior half of anal; the fifth on anterior part of caudal peduncle, and extending on and covering most of the soft portions of the dorsal and anal fins; the last one at base of caudal; the pale interspaces of about the same width as the dark bars, these marbled with dark areas; a jet-black V at nape, with limbs extending downward and backward, expanded distally; dorsal and anal fins of about same color as the dark bars; caudal dark, with pale markings; basal half of ventral pale, distal half black; pectoral dark at base, the rest of fin olivaceous, with dark spots. In the largest specimen, 500 mm. long, the bars have become rather obscure and the pale "ground color" has become dark and is spotted with white. These white or pale spots have spread sparingly into the "dark bars." The fins are rather dark, especially the ventrals, and all, exclusive of the ventrals, are spotted with white. The margin of the opercle is very dark. The juveniles, 33 and 40 mm. long, are plain yellowish, with the dark bars very definite.

Four specimens, 144 to 500 mm. (112 to 380 mm. to base of caudal) long, and two juveniles, 33 and 40 mm. (25 and 30 mm. to base of caudal) long, are included in the Peruvian collections studied. Four of these were collected by the Mission, one in Lobos de Tierra Bay, one in Lobos de Afuera Bay, one in Paita Harbor, and a juvenile in Samanco Bay, off Mount Campaña. The others, an adult and a juvenile, were obtained by R. E. Coker at Lobos de Afuera.

This species is close to *O. fasciatus*, a Japanese species. Upon comparison of two specimens from Japan (140 and 195 mm. long) with the Peruvian material, it was found that *fasciatus* has 12 dorsal spines, whereas all the specimens of *insignis* at hand have only 11. Furthermore, the mouth is smaller, as the maxillary does not reach the vertical from the anterior margin of the eye, which it does in *insignis* of similar size, and it is contained 3.4 to 3.5 in the head. The anterior rays of the soft parts of the dorsal and anal are produced, forming acute lobes, making the margins of the fins concave, whereas the lobes are rounded and the margins are straight to slightly convex in *insignis* of the same length. The caudal fin is more deeply concave in *fasciatus*, the ventral fins are more sharply pointed; scales do not extend nearly so far on the vertical fins; instead of 6 dark bars, it has 7, the first 4 being situated as in *insignis*, the fifth being narrower and wholly in advance of the caudal peduncle, making room for the additional bar on the middle of the peduncle; and the ground color is plainer.[20]

It is stated in the report of the Mission (1943, p. 277) that the "loro" occurs in "limited quantities in the northern part of Peru." It is reported also that "it is rarely, if ever, seen in the markets." The largest example taken was "about 75 cm. long."

Range.—Coast of northern Peru and the Galápagos Islands.

Family APLODACTYLIDAE

Body oblong; branchiostegals 5 or 6; teeth in the jaws compressed, flat, tricuspid, wanting on vomer and palatines; gills 4; scales cycloid, small, generally more than 75 in a lateral series; dorsal fin divided with about 15 to 17 spines and about 20 soft rays; anal with 3 spines and 6 or more soft rays; ventral inserted far behind pectoral, with 1 spine and 5 soft rays; several of the lower rays of pectoral simple (undivided), with the tips free and more or less thickened.

Genus APLODACTYLUS Cuvier and Valenciennes, 1831

Body quite elongate, compressed; back moderately elevated; preopercle entire; opercle with a single flat spine; gill membranes somewhat united, free from the isthmus; teeth broad, tricuspid, in series in each jaw; scales quite small, 100 or so in a lateral series, many small scales on cheek and opercle; anal with about 8 to 10 soft rays.

Several species have been described, though not well differentiated. The specimens from Peru that were studied quite certainly are all of one species.

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[20] According to Fowler (U. S. Nat. Mus. Bull. 100, vol. 12, p. 219, 1933) *O. fasciatus* may have 11 or 12 spines, or according to his figure only 10, the dark bars vary in shape and number, and no dark marblings or reticulations are mentioned in his description or shown in the four color phases illustrated by him. Fower's statement that *fasciatus* has a naked interorbital and that it therein differs from *insignis* is not true of the specimens now at hand, in all of which minute, somewhat embedded scales cover the interorbital.

APLODACTYLUS PUNCTATUS Cuvier and Valenciennes

JERGUILLA; NONORA; QUERGUIA

FIGURE 69

Aplodactylus punctatus CUVIER and VALENCIENNES, 1831, p. 477, Valparaiso, Chile (original description).—EVERMANN and RADCLIFFE, 1917, p. 115, pl. 11, fig. 1, Callao, and Ballestas Island, region of Pisco, Peru (synonymy; description).
Haplodactylus punctatus STEINDACHNER, 1902, p. 118, Callao, Peru (notes).

Head 3.8 to 4.3; depth 2.9 to 3.2; D. XIV or XV–I, 18 to 20; A. III, 8 or 9; P. 15 (rarely 14), the lower 5 or 6 rays simple; scales 103 to 110; vertebrae 33 (one specimen dissected).

Body elongate, compressed, its greatest thickness about half its depth; profile rather steep over snout, nearly straight and only moderately elevated over rest of head; back narrow; caudal peduncle moderately long, compressed, 1.8 to 2.1 in head; snout rather blunt, 2.5 to 2.8; eye placed high, 4.8 to 5.2; interorbital somewhat swollen anteriorly, 3.3 to 3.6; mouth quite small, below the somewhat projecting snout; upper lip rather broad; maxillary not quite reaching vertical from front of eye, 3.2 to 3.4 in head; teeth flat, tricuspid, in 3 irregular series in each jaw, those of the outer series largest, those of the other series progressively smaller; gill membranes connected, free from the isthmus; gill rakers short, slender, 14 or 15 on lower and 2 to 4 on upper limb of first arch; lateral line complete, scarcely arched, reaching middle of side above base of anal; scales small, with smooth membranous border, exposed part striate, extending forward only to nape, numerous small scales present on cheek and opercle, forming a fleshy sheath on base of first dorsal, extending on bases of second dorsal and anal, covering caudal except distally, and extending on base of pectoral, about 20 to 22 longitudinal rows between lateral line and first dorsal spine and about 10 to 12 between it and base of last ray of

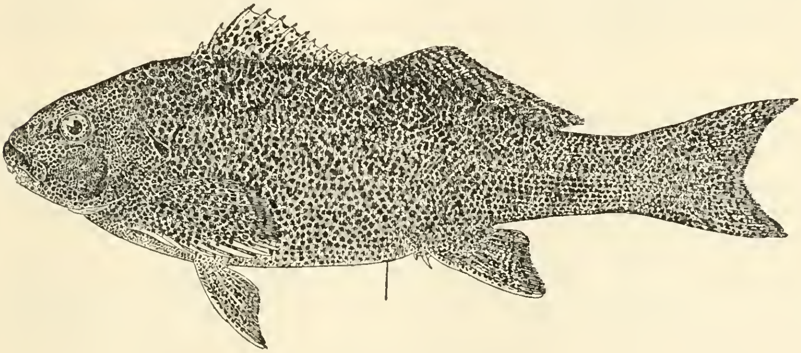

FIGURE 69.—*Aplodactylus punctatus* Cuvier and Valenciennes. From a specimen 365 mm. long, Callao, Peru (U.S.N.M. No. 77689). (After Evermann and Radcliffe, 1917.)

dorsal; dorsal fins nearly or quite separate, the fourth or fifth spine generally longest, 2.0 to 2.4 in head; second dorsal highest anteriorly, the longest rays higher than the longest spines, its base of about same length as that of first dorsal; caudal with a rather shallow fork, both lobes acute, the upper the longer, equal to or a little longer than head; anal small, the first 2 spines small, partly free, the third closely adherent to first soft ray, its point concealed, the second one, 5.0 to 6.0 in head, the anterior soft rays rather long, the longest only a little shorter than head; ventral inserted far behind base of pectoral, about half as far from pectoral as origin of anal, 1.1 to 1.3 in head; pectoral reaching a little beyond midlength of ventral, the lower simple rays slightly thickened distally, and free at tips, the uppermost simple ray generally the longest in the fin, about as long as head, 3.8 to 4.5 in length.

Color brownish above, somewhat paler below; some specimens considerably lighter, being grayish above; pale blotches, some of them tending to form bars, along back and side; body and fins almost everywhere with dark spots. The color of a fresh specimen, now 280 mm. long, was described by M. J. Lobell in his field notes as "olive green, dotted with black spots, which sometimes coalesce to form rivulations."

The collection furnished by the Mission contains six specimens 245 to 280 mm. (190 to 123 mm. to base of caudal) long, all taken with trammel nets, four at Viejas Island in Independencia Bay and two in San Juan Bay. A specimen, 240 mm. long, collected by R. E. Coker at Pisco also was examined.

It is stated in the report of the Mission (1943, p. 275) that this fish is known as "jerguilla" in northern Peru, and as "nonora" southward. Steindachner (see reference above) who reported this species from Callao, furnished the name "querguia." Although it was taken by the Mission from Chilca south to San Juan Bay, including a catch of 33 fishes, 210 to 430 mm. long, made in 2 hours, commercial catches were not reported in the statistics for 1940. The Mission found it to be "an excellent pan-fish, with rich, white, sweet, flaky meat."

Range.—Coasts of Peru and Chile.

Family CHEILODACTYLIDAE

Body oblong or ovate; branchiostegals 5 or 6; gills 4; teeth in the jaws more or less conical, wanting on vomer and palatines; scales cycloid, rather large, generally fewer than 75 in a lateral series; dorsal fin single, often deeply notched, with about 16 to 19 spines and 20 or more soft rays; anal with 3 spines and 9 or more soft rays; ventrals inserted far behind pectorals, each with 1 spine and 5 soft rays; several of the lower rays of pectoral simple, with free tips more or less thickened, one or two of them often somewhat produced.

A single genus comes within the scope of the present work.

Genus CHEILODACTYLUS Lacepède, 1803

Body oblong, compressed; back elevated; branchiostegals 5 or 6; preopercle entire; gill membranes separate (not connected across isthmus); teeth in a band in each jaw, conical or acute; scales moderately large, about 50 to 60 in a lateral series, numerous small scales on cheek and opercle; dorsal continuous, with about 16 to 19 spines, and about 25 to 32 soft rays; anal with 3 spines and about 9 to 15 soft rays.

Two species, one of which is new, are included in the Peruvian collections.

KEY TO THE SPECIES

a. Body deep; back rather strongly elevated; depth in adults 2.5 to 2.75 in length; upper jaw projecting little beyond the lower; lips only moderately thick, the upper one grayish or dusky; maxillary 3.4 to 4.3 in head. **variegatus** (p. 327)

aa. Body more elongate; back less elevated; depth 3.0 to 3.2 in length; upper jaw projecting more strongly; lips very thick, the upper one black; maxillary 3.2 to 3.4 in head________________ **elongatus**, new species (p. 329)

CHEILODACTYLUS VARIEGATUS Cuvier and Valenciennes

PINTADILLA

Cheilodactylus variegatus CUVIER and VALENCIENNES, 1833, p. 493, Valparaiso, Chile (original description).—GÜNTHER, 1860, p. 81, coasts of Chile and Peru (synonymy; description).—ABBOTT, 1899, p. 357, Callao, Peru (synonymy; notes).—STEINDACHNER, 1902, p. 122, Callao, Peru.—STARKS, 1906, p. 797, Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 113, Pescadores Island, Ancon, Guañape North Island, Paita, Independencia Bay, Mollendo, and Lobos de Afuera, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 511, North Chincha Island and Guañape, Peru.—FOWLER, 1940b, p. 779, Callao, Peru.

Cheilodactylus cinctus TSCHUDI, 1845, p. 15, pl. 2, Peru (original description).

Head 2.9 to 3.15; depth 2.5 to 2.8; D. XVI or XVII, 26 to 32 (usually 28 to 30); A. III, 9 or 10; P. 14, the lower 6 rays simple; scales 50 to 57; vertebrae 34 (one specimen dissected).

Body rather deep, compressed, its greatest thickness usually rather less than half its depth; profile rather steep, and moderately convex anterior to dorsal fin; back narrow; caudal peduncle compressed, 3.0 to 3.5 in head; snout moderately long and pointed, 2.6 to 3.0; eye 4.2 to 5.1; interorbital somewhat swollen anteriorly, 3.7 to 4.4; mouth rather small, horizontal; lower jaw included, a little shorter than the upper; lips moderately thick, the fold of lower lip interrupted at symphysis; maxillary not quite reaching vertical from anterior margin of eye, 3.4 to 4.3 in head; teeth in each jaw rather bluntly pointed, in a band anteriorly, reduced to a single series posteriorly, several of the posterior teeth in upper jaw enlarged; gill rakers short, slender, 14 to 17 more or less developed on lower and 5 to 7 on upper limb of first arch; lateral line complete, following contour of back, remaining decidedly above midline on caudal peduncle; scales with smooth membranous edges, exposed part roughly sculptured, reduced scales extending forward on interorbital, small scales present on cheek and opercle, greatly reduced scales on median section of chest anterior to ventral fins, a sheath on base of dorsal, and a very narrow one on base of anal, extending far on caudal fin, and somewhat on base of pectoral, 6 longitudinal rows of scales between lateral line and first dorsal spine and 2 between it and last ray of dorsal; dorsal fin continuous, the posterior spines quite short, the sixth or seventh usually longest, 2.6 to 3.6 in head; soft part of fin highest anteriorly, the longest rays of about the same length as the longest spines; caudal forked, the upper lobe the longer, shorter than head by half length of snout; anal small, the first two spines largely disconnected, the third closely adherent to first soft ray, its point concealed, the second one 4.4 to 5.5 in head, the soft part with a produced lobe anteriorly, fully as long as head posterior to middle of eye; ventral inserted a little more than half as far from base of pectoral as from origin of anal, somewhat thickened by membrane, 1.5 to 1.8 in head; 6 lower rays of pectoral simple, slightly thickened and separate distally, the two upper simple rays generally the longest, 1.2 to 1.4 in head, 3.75 to 4.5 in length.

Color brownish gray above, pale underneath; with six or seven light cross bars, the two anterior ones often obscure, the first sometimes only a blotch under anterior part of spinous part of dorsal, the second under middle of spinous part of dorsal, often not extending below middle of side, the third bar extending from bases of last spines and anterior soft rays of dorsal, obliquely downward and backward to origin of anal, two more light bars under soft dorsal, one on caudal peduncle and sometimes a very narrow one at base of caudal; membranous margin of opercle above distal angle pale; dorsal fins dusky, the light bars of side sometimes extending somewhat on base of fin; caudal, anal, ventral, and pectoral all dusky at base, distally pale. Conspicuous color features in life, as described by Evermann and Radcliffe (see reference above), are: Bright reddish-orange tips and margins of caudal, anal, ventral, and pectoral fins; about four somewhat irregular white bars; belly and throat white or nearly so, showing a slight greenish tint in some specimens; ground color of side and back very dark brown; each scale with a broad margin of dark brown, centrally light greenish or brownish gray with metallic luster; under surface of opercle very dark except for a broad marginal zone of dusky white; soft dorsal faintly tipped with orange-red.

The collection furnished by the Mission contains 24 specimens, 165 to 345 mm. (131 to 280 mm. to base of caudal) long. The specimens were taken at the localities named: Lobos de Tierra Bay, Guañape Island, Chimbote Bay, Samanco Bay, Pachacamac Island, Chilca Bay, La Lagunilla, Viejas Island, San Juan Bay, and Atico Point. Seven specimens, collected by R. E. Coker at Paita, Ancon, Santa Rosa Island, and Mollendo, also are at hand. According to the report of the Mission (1943, p. 275) this is the "commonest species of rockfish found in Peruvian waters." Numerous examples were reported to have been taken, where there was rocky bottom, between Paita and Mollendo. The largest ones caught were about 400 mm. long. While no ripe females were seen, males with freely flowing milt were taken at La Lagunilla on June 24. Although this fish is reported to be rather bony, and for that reason not especially highly esteemed as a food fish, rather large quantities are marketed, the principal catches being landed at Ancon, Callao, and Pucusana. The fish may be caught with trammel and gill nets and with hand lines.

Range.—Coasts of Peru and Chile.

CHEILODACTYLUS ELONGATUS, new species

PINTADILLA

FIGURE 70

Head 3.0 to 3.2; depth 3.0 to 3.2; D. XVI or XVII, 27 to 30; A. III, 9 or 10; P. 14; the lower 6 rays simple; scales 50 to 56; vertebrae 35 (one specimen dissected).

Body elongate, compressed, its greatest thickness about half its depth; profile only moderately steep and gently convex anterior to dorsal fin; back narrow; caudal peduncle rather deep, compressed, 3.2 to 3.7 in head; snout long and pointed, 3.0 to 3.8; eye large, 4.8 to 5.3; interorbital 3.8 to 4.1; mouth moderate, nearly horizontal; lower jaw included, considerably shorter than the upper; lips very thick, the fold of lower jaw sometimes not interrupted at symphysis; maxillary scarcely reaching vertical from anterior margin of eye, 3.2 to 3.4 in head; teeth pointed, in a band anteriorly in each jaw, reduced to a single series posteriorly, several of the posterior teeth in upper jaw somewhat enlarged; gill rakers short, very slender, 14 to 16 more or less developed on lower and 5 to 7 on upper limb of first arch; lateral line complete, following the contour of the back, remaining far above midline on caudal peduncle; scales with smooth, membranous edges, exposed surface roughly sculptured, reduced scales extending forward on interorbital, small scales present on cheek and opercle, greatly reduced scales on median section of chest anterior to ventral fins, a scaly sheath on base of dorsal, and a narrower one on base of anal, scales covering caudal fin except distally, and extending somewhat on base of pectoral, 6 longitudinal rows between lateral line and first dorsal spine, and 2 rows between it and last ray of dorsal; dorsal fin continuous, the posterior spine rather short, the sixth or seventh generally longest, 3.1 to 4.2 in head; soft part of fin somewhat higher anteriorly than posteriorly, the longest rays equal to or longer than the longest spines; caudal forked, the upper lobe the longer, a little longer than head without snout; anal small, the first two spines largely free, the third closely adherent to first soft ray, the second one 4.5 to 6.3 in head, the soft part with a produced anterior lobe, about as long as head posterior to middle of eye; ventral inserted about half as far from base of lowermost ray of pectoral as from origin of anal, not thickened by membrane, 1.7 to 1.9 in head; 6 lower rays of pectoral simple, their free tips slightly thickened, the two upper simple rays the longest, generally reaching somewhat beyond midlength of ventral, 1.25 to 1.6 in head, 4.0 to 4.5 in length.

Color quite dark brown; lower surface of head, chest, and abdomen pale, side with four pale bars, the first extending from bases of last spines and anterior soft rays of dorsal obliquely downward and backward to origin of anal, the next two under soft dorsal, and the last on caudal peduncle; upper lip and exposed part of maxillary nearly black; membranous margins darker than rest of exposed parts of scales; fins all rather dark brown; inner side of pectoral very dark; simple rays of pectoral distally pale; outer margin of ventral pale.

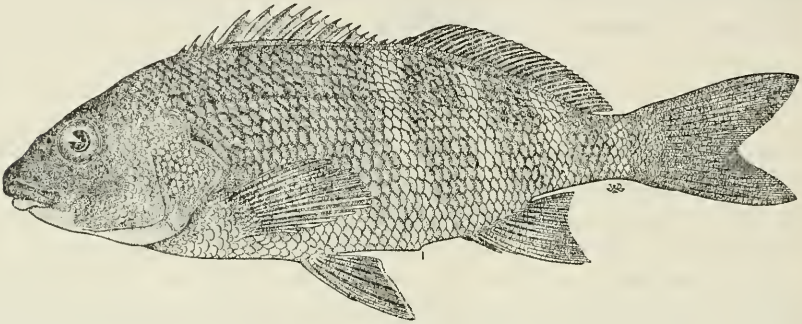

FIGURE 70.—*Cheilodactylus elongatus*, new species. From the type, 385 mm. long, Lobos de Afuera Bay, Peru (U.S.N.M. No. 128063).

This apparently new species of pintadilla is represented in the collection furnished by the Mission by four specimens, 315 to 390 mm. (253 to 318 mm. to base of caudal) long. Two of these were seined in Lobos de Tierra Bay, and two were taken in a trammel net in Lobos de Afuera Bay. One of the specimens from Lobos de Afuera Bay (U.S.N.M. No. 128063), which is 385 mm. (310 mm. to base of caudal) long, has been selected as the type, and the following proportions and enumerations are based on this specimen: Head 3.0 in length; depth 3.0; pectoral 4.3. Eye 5.3 in head; snout 3.8; interorbital 3.9; maxillary 3.2; caudal peduncle 3.5; sixth dorsal spine 3.5; second anal spine 6.0; ventral 1.7; pectoral 1.4. D. XVI, 29; A. III, 10; P. 8+6; V. I, 5; scales 6—54; gill rakers 6+15.

The four specimens of this species in the collection all appear either to have been more or less dry or to have been preserved in too strong a solution of alcohol, which caused shrinkage, and therefore are not in an especially good condition. However, they undoubtedly represent a slenderer fish, with a lower back, than *C. variegatus*. Furthermore, the eye apparently is larger, the snout and maxillary are a little longer, the upper jaw projects more strongly, the lips are notably broader, the ventral and pectoral fins are less fleshy, the color is decidedly darker, and pale blotches and bars anterior to beginning of soft part of dorsal are missing. As only one specimen of *C. variegatus*, of the many at hand, is large enough to come within the range of length of the specimen of *C. elongatus*, the proportions based on it alone are directly comparable. In the following list the proportions are all given in the percent of the length to base of caudal, those based on the single specimen of *C. variegatus*, which is 280 mm. long to base of caudal, being given first in each instance, and the range of those based on the 4 specimens of *C. elongatus* second. Depth 40, 31.5 to 33.5; eye 5.7, 6.0 to 6.7; snout 11.7, 11.6 to 12.0; maxillary 9.2, 9.2 to 10.3. Differences in the same proportions still are evident if specimens of *C. variegatus* ranging upward of 250 mm. in total length are compared with the type material of *C. elongatus*, for in seven specimens of *C. variegatus*, the following range was found: Depth 36.5 to 40; eye 5.7 to 6.25; snout 9.4 to 11.7; maxillary 7.2 to 9.2.

Range.—Known only from the type material from Lobos de Tierra Bay, and Lobos de Afuera Bay.

Family POMACENTRIDAE

Body usually short and deep, well compressed; mouth small, usually terminal; teeth conic or incisorlike, in one or more series or in a narrow band in each jaw, none on vomer or palatines; preorbital sheathing maxillary; nostril single; gills 3½, slit behind the last small or obsolete; lateral line ending under soft part of dorsal; scales large, ctenoid; dorsal fin long, continuous, with rather numerous spines (12 to 14 in Peruvian genera); anal with 2 spines, its soft part similar to that of dorsal; ventral thoracic, with 1 spine and 5 soft rays.

This is a family of small, usually brilliantly colored fishes, which live mostly on coral reefs and among rocks where they feed principally on small animals and plants.

KEY TO THE GENERA

a. Teeth conical, each jaw with an outer, somewhat enlarged, series, followed anteriorly by 2 or more series or by a narrow band of small teeth; suborbital adnate to cheek------------------------------------ **Chromis** (p. 332)

aa. Teeth more or less compressed, in a single series in each jaw; suborbital adnate or free from cheek.

  b. Margin of preopercle serrate; lower margin of suborbital free, serrate; teeth with straight or slightly truncate cutting edges-- **Pomacentrus** (p. 337)

  bb. Margin of preopercle entire; lower margin of suborbital, if free, not serrate.

    c. Teeth broad, more or less bicuspid; lower margin of suborbital free for its entire length; dorsal with about 12 to 14 soft rays. **Abudefduf** (p. 338)

    cc. Teeth narrow, with straight or slightly rounded cutting edges; lower margin of suborbital adnate to cheek anteriorly, somewhat free posteriorly; dorsal with about 17 to 19 soft rays----- **Nexilosus** (p. 340)

Genus CHROMIS Cuvier, 1815

Body oblong or ovate, the depth about half or less than half the length; mouth small, oblique; teeth conical, fixed, each jaw with an outer somewhat enlarged series, followed anteriorly by a narrow band, sometimes by two or more irregular series, discontinued laterally; suborbital adnate to cheek (sometimes slightly free anteriorly); preopercle entire; gill rakers slender, rather numerous (about 18 to 24 on lower limb of first arch in Peruvian species); scales large, about 24 to 33 vertical series along middle of side; scales reduced in size on upper surface of head, extending nearly to rim of mouth; dorsal with about 12 to 14 spines, and about an equal number of soft rays; caudal usually rather deeply forked.

KEY TO THE SPECIES

a. Body elongate, depth 2.6 to 3.4 in length; 30 to 32 vertical series of scales along middle of side; anal with 10 or 11 soft rays; caudal fin with a conspicuous dark stripe on each lobe, rest of fin light------**atrilobatus** (p. 332)

aa. Body deeper, depth 1.8 to 2.2 in length; 26 to 29 vertical series of scales along middle of side; anal with 12 to 15 (rarely 11) soft rays; caudal fin nearly uniform in color.

  b. Head large, 2.75 to 3.2 in length; dorsal with 13 (rarely 14) spines, posterior ones shorter than some of more anterior ones; margin of anal broadly rounded--**crusma** (p. 334)

  bb. Head smaller, 3.2 to 3.9 in length; dorsal with 12 spines, those following the third of about uniform length; margin of anal forming an acute angle. **intercrusma** (p. 335)

CHROMIS ATRILOBATUS Gill

Chromis (*Furcaria*) *atrilobata* GILL, 1862, p. 149, Cape San Lucas, Baja California (original description, compared with *C. punctatus* (Poey)).

Chromis atrilobatus EVERMANN and RADCLIFFE, 1917, p. 117, Lobos de Afuera, Peru (synonymy; description; range).—MEEK and HILDEBRAND, 1925, p. 696, pl. 69, fig. 2, Panama Bay (synonymy; diagnosis; compared with *C. marginatus* (Castelnau) of the Atlantic coast).

Head 3.2 to 3.6; depth 2.65 to 3.4; D. XII, 12 or 13; A. II, 10 or 11; P. 17 or 18; scales 30 to 32 vertical series along middle of side.

Body elongate, rather strongly compressed, its greatest thickness about 2.5 in its depth; back moderately elevated; dorsal outline scarcely more convex than the ventral; caudal peduncle moderately long, quite compressed, 2.2 to 2.7 in head; snout somewhat pointed, 3.2 to 5.2; eye 2.9 to 3.6; interorbital 3.55 to 5.0; mouth moderately small, oblique, terminal; maxillary reaching somewhat beyond vertical from anterior margin of eye, 2.75 to 3.5 in head; each jaw with an enlarged outer series of conical teeth, followed anteriorly by a very narrow band of smaller, pointed teeth; gill membranes separate; gill rakers slender, about half length of eye, 18 or 19 on lower and about 8 on upper limb of first arch; margin of preopercle irregular, not definitely serrate; suborbital slightly free from cheek anteriorly; lateral line ending under posterior rays of dorsal, reappearing on middle of caudal peduncle with suggestions of pores; scales strongly ctenoid, absent only on a narrow space about the mouth, 1 row on pre- and suborbital, 3 rows on cheek, and 3 on opercle, forming a sheath along base of dorsal, and extending on bases of all the fins, exclusive of ventrals, 3 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the spines following the fourth or fifth, all of about the same length, 2.3 to 2.75 in head; soft part of dorsal high, with an acute lobe, longest ray 1.4 to 1.6 in head; caudal deeply forked, both lobes sharply pointed, upper one slightly the longer, somewhat exceeding length of head; anal similar to soft dorsal, its lobe scarcely as high, and somewhat less acute, the second spine rather small, 2.3 to 2.8 in head; ventral inserted under base of lower rays of pectoral, with a large axillary scale, 1.3 to 1.5 (without filament) in head; pectoral rather long, about as long as head, 3.6 to 5.0 in length.

Color of old preserved specimens dark brown above, pale brown underneath. A small specimen (30 mm. long) pale olivaceous, with a dark stripe on middle of side, extending from tip of pectoral to base of caudal. The "color in life" has been described by Evermann and Radcliffe (see reference above), presumably from R. E. Coker's field notes, as follows: "Olivaceous above; below bluish silvery, and very obscurely striped; a pale spot (gold when first taken) on back at posterior limit of dorsal, the spots of the two sides confluent posteriorly behind dorsal; a broad black stripe extending from insertion of each lobe of caudal to its slender tip; just above dorsal stripe and just below ventral stripe the fin is very narrowly margined with pink; between the stripes the fin is olivaceous proximally and pink posteriorly; dorsal almost black, a small part including last two to four rays olivaceous proximally and reddish distally; distal half of anal light olive, pectoral reddish at base, insertion black." The dark color on the fins, and especially on the base of the pectoral, remains prominent in the preserved specimens.

The description is based on four specimens, 30 to 105 mm. (22 to 80 mm. to base of caudal) long. The smallest one was taken in a surface net, in the vicinity of Cabo Blanco, by the Mission. The others were collected at Lobos de Afuera by R. E. Coker. These specimens were compared with others from Panama Bay and were found to be rather slenderer, the pectoral fins seem to be proportionately a little longer, and the average number of scales (in a lateral series), and gill rakers probably is a little lower. When more material becomes available from Peru it probably can be shown that the southern specimens are at least subspecifically distinct.

This pretty fish, which apparently rarely reaches a length as great as 150 mm., probably is not numerous in Peru.

Range.—Baja California to northern Peru.

CHROMIS CRUSMA (Cuvier and Valenciennes)

CHAVELITA; JUNICHE; CONGUYO; CONGUITO; CASTAÑETA; CASTAÑUELA; BURRITO; COCO

Heliases crusma CUVIER and VALENCIENNES, 1833, p. 510, Valparaiso and Juan Fernández Island, Chile (original description; specimen from Juan Fernández Island probably not this species, but *C. intercrusma*).

Chromis crusma ABBOTT, 1899, p. 358, Callao, Peru.—STARKS, 1906, p. 798, Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 118, Mollendo, Callao, and Santa Rosa Island, Peru (synonymy; description; note on common names).—NICHOLS and MURPHY, 1922, p. 511, North Chincha Island, Peru.—FOWLER, 1940b, p. 784, fig. 62, Peru.

Head 2.75 to 3.2; depth 1.8 to 2.2; D. XIII (rarely XIV), 12 (occasionally 11 or 13); A. II, 12 (rarely 11 or 13); P. 20 or 21 (rarely 19); scales 26 to 28 vertical series along middle of side; vertebrae 26 (one specimen dissected).

Body rather deep, strongly compressed, its greatest thickness about 2.5 in its depth; back strongly elevated; outline anterior to dorsal quite convex; caudal peduncle moderately long, strongly compressed, 2.0 to 2.4 in head; snout short, blunt, 3.8 to 4.5; eye 3.2 to 3.8; interorbital 3.0 to 4.0; mouth small, oblique, terminal or slightly superior; maxillary generally extending to vertical from anterior margin of eye, 2.9 to 3.3 in head; each jaw with an outer series of somewhat enlarged conical teeth, followed anteriorly by smaller conical teeth in a narrow band or sometimes in about 3 irregular rows; gill membranes slightly connected, free from the isthmus; gill rakers slender, about half length of eye, 21 to 24 on lower and 7 to 9 on upper limb of first arch; margin of preopercle entire; suborbital adnate to cheek; lateral line ending under posterior rays of dorsal; scales strongly ctenoid, absent only on a narrow area about the mouth, 2 or 3 main rows on preorbital, and 2 or 3 main rows on opercle, forming a rather indefinite sheath along base of dorsal and anal, and extending on bases of all the fins exclusive of ventrals (covering nearly entire caudal in adults), 3 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the posterior spines considerably shorter than the third to about the eighth, the longest 1.75 to 2.3 in head; soft part of dorsal high, forming a moderately acute lobe, the longest rays 1.4 to 1.7 in head; caudal fairly deeply forked, especially in adults, upper lobe the longer, equal to or a little longer than head; anal with a broadly rounded margin, the longest rays a little lower than those of dorsal, second spine rather long and strong, 1.75 to 2.3 in head; ventral inserted immediately behind base of pectoral, with a large axillary scale, 1.2 to 1.4 (without filament) in head; pectoral rather long, reaching somewhat beyond tip of ventral and generally well beyond origin of anal, usually a little longer than head, 2.7 to 3.3 in length.

Color dark brown above; pale brown, with silvery reflections in some specimens, on lower part of side and underneath. Some specimens notably darker than others; the lighter specimens with dark lines along the rows of scales on lower part of side; pectoral very dark at base, otherwise mostly pale olivaceous; other fins rather dusky.

This species is represented by seven specimens, 140 to 170 mm. (110 to 126 mm. to base of caudal) long, obtained by the Mission. Eleven additional specimens, 45 to 170 mm. (33 to 128 mm. to base of caudal) long, included in the U. S. National Museum collection, mostly obtained by R. E. Coker, also were examined. These specimens were all used in obtaining the proportions and enumerations given in the description. The specimens secured by the Mission were taken with trammel and gill nets set near rocks in Paita Bay, Guañape Island, North Chincha Island, and San Juan Bay. The other specimens examined are from Mollendo, Callao, and Santa Rosa Island.

This species seems to have numerous common names, which probably also are applicable to *C. intercrusma*, from which it very probably is not distinguished by fishermen. In M. J. Lobell's field notes the names "castañeta" and "burrito" are used for both species. Castañeta is also given for *Nexilosus latifrons*. *C. crusma* apparently is of little, if any, commercial value.

Range.—Coasts of Peru and Chile.

CHROMIS INTERCRUSMA Evermann and Radcliffe

FIGURE 71

?*Heliases crusma* CUVIER and VALENCIENNES, 1833, p. 510, Valparaiso and Juan Fernández Island, Chile (specimen described from Juan Fernández Island probably of this species).

Chromis intercrusma EVERMANN and RADCLIFFE, 1917, p. 119, pl. 11, fig. 3, Guañape North Island, Peru (synonymy; original description; compared with *crusma*).

Head 3.2 to 3.9; depth 1.9 to 2.2; D. XII, 13 to 15 (usually 14); A. II, 13 or 14; P. 19 to 21; scales 27 to 29, vertical series along middle of side; vertebrae 24 or 25 (two specimens dissected).

Body moderately short and deep, strongly compressed, its greatest thickness about 2.5 in its depth; back strongly elevated; outline nearly straight over snout and eyes, strongly convex at nape; caudal peduncle moderately long, strongly compressed, 1.8 to 2.4 in head; snout short, moderately blunt, 3.5 to 4.5; eye 3.1 to 4.3; interorbital 2.0 to 3.8; mouth small, oblique, terminal, or slightly superior; maxillary extending to vertical from anterior margin of eye, 2.8 to 3.2 in head; each jaw with an outer series of somewhat enlarged conical teeth, followed anteriorly by a narrow band of smaller conical teeth (all rather blunt in some of the larger specimens); gill membranes very slightly connected, free from the isthmus; gill rakers slender, fully half length of eye, 19 to 23 on lower and 6 to 8 on upper limb of first arch; margin of preopercle entire; suborbital fully adnate to cheek; lateral line ending under posterior rays of dorsal; scales strongly ctenoid, absent only on a narrow space about the mouth, about 3 rows on preorbital, 3 or 4 main rows on cheek and 3 or 4 on opercle, forming a sheath along bases of dorsal and anal, and extending on bases of all the fins exclusive of ventral (covering caudal almost entirely in adults), 3 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the spines following the third one all of about equal length, the longest 2.0 to 2.5 in head; soft part of dorsal high, forming an acute lobe, longest rays 1.4 to 1.6 in head; caudal deeply forked, especially in adults, upper lobe notably the longer, exceeding length of head by more than diameter of eye in large examples; anal similar to soft part of dorsal, its lobe only a little less acute and scarcely lower than that of dorsal, the second spine rather long and strong, 1.9 to 2.2 in head; ventral inserted immediately behind base of pectoral, with a moderately large axillary scale, 1.1 to 1.3 (without filament) in head; pectoral moderate, reaching little beyond tip of ventral but scarcely to origin of anal, generally about as long as head, 3.2 to 3.5 in length.

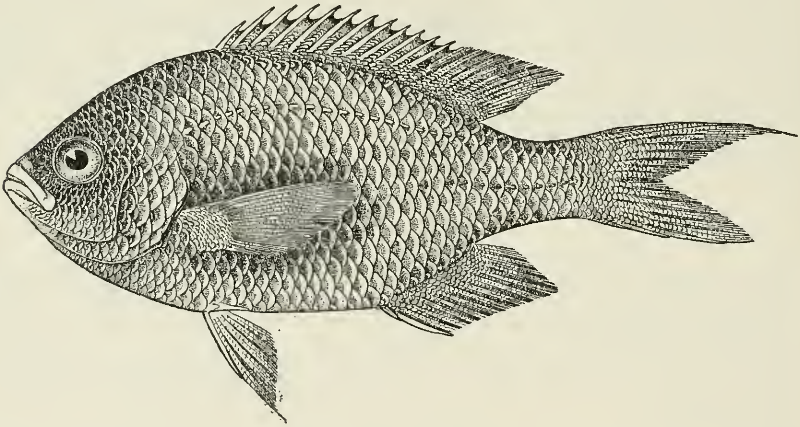

Figure 71.—*Chromis intercrusma* Evermann and Radcliffe. From the type, 150 mm. long, Guañape North Island, Peru (U.S.N.M. No. 77665). (After Evermann and Radcliffe, 1917.)

General color brown; grayish brown underneath; each scale with a dark brown center, some on chest and abdomen with a metallic luster; pectoral dark at base, otherwise pale olivaceous; other fins dusky.

This species is represented by 12 specimens, 175 to 280 mm. (128 to 209 mm. to base of caudal) long, in the collection made by the Mission. In addition 3 paratypes (U.S.N.M. No. 77590), 80, 80, and 85 mm. (58, 58, and 61 mm. to base of caudal) long, are at hand. The proportions and enumerations used in the description are based on the 15 specimens examined. The specimens secured by the

Mission were taken with trammel and gill nets, set near rocks, at Cabo Blanco, Sechura Bay, Lobos de Afuera Bay, and Guañape North Island.

The numerous local names given for *C. crusma* presumably apply to this species also, as the two apparently are not distinguished by fishermen. The species are very similar in general appearance. Upon close examination several differences, however, become evident. These are stated in the comparison that follows.

C. crusma	*C. intercrusma*
Head large, 31.5 to 34 percent of length.	Head smaller, 27 to 31 percent of length.
Pectoral fin long, generally reaching well beyond origin of anal, 30 to 37 percent of length.	Pectoral fin shorter, usually not quite reaching origin of anal, 28 to 30 percent of length.
Dorsal with 13 (rarely 14) spines, and 12 (occasionally 11 or 13) soft rays; posterior spines notably shorter than the fourth to about the eighth.	Dorsal with 12 spines and 14 (occasionally 13 or 15) soft rays; the spines following the third, all of about equal length.
Anal with 12 (rarely 11 or 13) soft rays, its margin broadly rounded.	Anal with 13 or 14 soft rays, its margin forming an acute angle.
Caudal moderately forked, the upper lobe equal to or little longer than head.	Caudal deeply forked, the upper lobe longer than head by fully an eye's diameter in large examples.

Range.—Peru, probably south to Juan Fernández Island, Chile.

Genus POMACENTRUS Lacepède, 1802

Body ovate, strongly compressed; head short; mouth small, terminal; teeth fixed, in a single series in each jaw, compressed, with straight or slightly truncate cutting edges; suborbital with lower margin free, serrate; margin of peropercle serrate; scales large, ctenoid, missing only about the mouth; dorsal fin continuous, with about 12 or 13 graduated spines; anal with 2 spines and about 12 to 14 soft rays.

These fishes generally live about rocks and on coral reefs. A single species comes within the scope of the present work.

POMACENTRUS RECTIFRAENUM Gill

Pomacentrus rectifraenum Gill, 1862, p. 148, Cape San Lucas, Baja California (original description).—Regan, 1913, p. 279, Lobos de Tierra, Peru.—Meek and Hildebrand, 1925, p. 698, Panama Bay (synonymy; description; range).

Head 3.0 to 3.2; depth 2.0 to 2.2; D. XII (rarely XI), 15 or 16; A. II, 12 or 13; P. 21 or 22; scales (vertical series along middle of side) 26 to 28; vertebrae 25 (one specimen dissected).

Body ovate, strongly compressed, its greatest thickness about 2.5 in its depth; back elevated; dorsal outline anteriorly more strongly convex than the ventral; caudal peduncle moderately short, 2.0 to 2.2 in head; snout moderately blunt, 3.4 to 4.1; eye 2.8 to 3.3; interorbital 3.8 to 4.4; mouth small, slightly oblique, terminal;

maxillary scarcely reaching vertical from anterior margin of eye, 3.4 to 3.9 in head; teeth in a single series in each jaw, compressed, with smooth, straight cutting edges; gill membranes slightly connected, free from the isthmus; gill rakers about as long as pupil, 11 to 13 on lower and 5 to 7 on upper limb of first arch; preopercle and suborbital each with a serrated margin; suborbital scarcely as wide as pupil; lateral line ending under posterior rays of dorsal; scales strongly ctenoid, extending slightly forward of interorbital, 3 rows on cheek and 3 on opercle, extending on bases of all the fins exclusive of ventrals, 3 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the spines graduated, the last one 1.6 to 2.2 in head; soft part of dorsal somewhat elevated, slightly acute, longest rays 1.2 to 1.6 in head; caudal with a rather shallow fork, the lobes round, the upper one longest, about as long as head; anal similar to soft part of dorsal, the second spine rather strong, 1.7 to 2.0 in head; ventral inserted under or slightly behind base of lower rays of pectoral, 1.0 to 1.15 (without filament) in head; pectoral broad, with slightly convex margin, about as long as head, 3.0 to 3.6 in length.

Color dark brown above, only a little lighter brown underneath; sides with dark vertical lines on the series of scales, or in the young with alternate light and dark lines. The smaller specimens with a dark ocellus at base of anterior soft rays of dorsal, and with numerous bluish spots, these most numerous and distinct on head, and at bases of dorsal and anal fins; these markings missing in the larger specimens but apparently not disappearing at a uniform size. Pectoral greenish to slightly dusky; other fins dark brown.

This species, which is new to the fauna of Peru, is represented in the collection furnished by the Mission by 14 specimens, 30 to 60 mm. (22 to 45 mm. to base of caudal) long, all taken in Lobos de Afuera Bay in rocky inlets. These fish were compared with others from Panama, with which they seem to be identical.

Range.—Mazatlán, Mexico, to northern Peru.

Genus ABUDEFDUF Forskål, 1775

Body ovate, strongly compressed; head short; mouth small, terminal; teeth fixed, in a single series in each jaw, compressed, usually more or less bicuspid; suborbital with lower margin free and smooth; margin of preopercle smooth (unarmed); scales large, ctenoid, missing only on snout; dorsal fin continuous, with about 12 or 13 spines, the posterior ones shorter than some of the more anterior ones, about an equal number of soft rays; anal with 2 spines and about 10 to 12 soft rays.

These fishes generally live about rocks and submerged objects. A single species has been taken in Peru.

ABUDEFDUF SAXATILIS (Linnaeus)

Chaetodon saxatilis Linnaeus, 1758, p. 276, "India," probably meaning West Indies (diagnosis).

Abudefduf saxatilis Evermann and Radcliffe, 1917, p. 123, Lobos de Afuera, Peru (synonymy; diagnosis, based on one small specimen).—Meek and Hildebrand, 1925, p. 701, pl. 70, Panama, both coasts (synonymy; description; range).

Head 3.0 to 3.2; depth 1.7 to 1.8; D. XIII, 13 or 14; A. II, 11 or 12; P. 19 or 20; scales (vertical series along middle of side) 26 to 28.

Body ovate, strongly compressed, its greatest thickness scarcely more than a third its depth; back elevated; dorsal outline anteriorly more strongly convex than ventral; caudal peduncle short, deep, strongly compressed, 1.9 to 2.0 in head; snout short, somewhat pointed, 3.9 to 4.2; eye 2.7 to 3.15; interorbital 3.2 to 3.5; mouth small, slightly oblique, terminal; maxillary scarcely reaching vertical from anterior margin of eye, 3.4 to 3.55 in head; teeth in a single series in each jaw, compressed, rather definitely bicuspid; gill membranes slightly connected, free from the isthmus; gill rakers about as long as pupil, 18 or 19 on lower and 6 or 7 on upper limb of first arch; preopercle and suborbital with smooth (unarmed) margins; suborbital very narrow, scarcely half width of pupil; lateral line ending under posterior rays of dorsal, reappearing with slight suggestion of pores on middle of peduncle; scales ctenoid, extending on interorbital, but not on snout, 2 principal rows on cheek and 2 on opercle, extending on bases of all the fins except ventrals, 4 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the fourth to sixth spines slightly longer than the succeeding ones, 1.6 to 2.2 in head; soft part somewhat elevated, scarcely angulate, the longest rays, 1.25 to 1.5 in head; caudal moderately forked, lobes somewhat pointed, the upper one longest, a little longer than head; anal similar to soft part of dorsal, its margin more convex, its longest rays of about the same length, the second spine rather strong, 1.8 to 2.3 in head; ventral inserted under base of lower rays of pectoral, 1.0 to 1.15 (without filament) in head; pectoral broad, with nearly straight margin, longest rays in upper part of fin, generally slightly longer than head, 2.9 to 3.0 in length.

Color dark brown above, only a little lighter underneath; side with five or six vertical bars, the first one (very obscure) extending from occiput to base of pectoral, next two under spinous part of dorsal, the fourth under anterior soft rays of dorsal, the fifth under last rays of dorsal, and a suggestion of a sixth one on caudal peduncle; spinous part of dorsal, base of soft part of dorsal and caudal, most of anal, and ventral very dark; pectoral, distal part of soft dorsal and caudal largely colorless.

The description is based on the five specimens, 70 to 85 mm. (50 to

61 mm. to base of caudal) long, furnished by the Mission. These fish are from Lobos de Afuera, where R. E. Coker also secured a small specimen, which is at hand. As it has been dry, it is of little value, though it agrees in the number of fin rays, scales, and gill rakers.

The Peruvian examples are much darker than the Panama specimens, with which they were compared. They differ also in having the lobes of the dorsal, caudal, and anal less strongly angulate, and the teeth seem to be broader and more definitely bicuspid. However, in the study of rather numerous specimens from Panama Bay I found much variation in these and some other characters. The significance of the variation can be determined only through a thorough study of large series of specimens from the range of the genus in at least the Western Hemisphere. About 10 nominal American species have been described, most of which have at some time been referred to synonymy, often seemingly without much more evidence than the original describer had for believing his specimens to represent new species.

Range.—Both coasts of America. On the Atlantic from Cape Cod to Uruguay, and on the Pacific from Baja California to northern Peru and the Galapágos Islands.

Genus NEXILOSUS Heller and Snodgrass, 1903

Body ovate, the depth generally rather less than half the length; teeth fixed, in a single series in each jaw, each tooth slightly broadened at tip, with an even (unindented) margin, suborbital adnate to cheek anteriorly, with free margin posteriorly (not fully adnate, as implied in the original description), being intermediate of *Nexilarius* in which it is fully adnate to the cheek, and *Abudefduf* in which its lower margin is free for its full length. It differs from both genera mentioned in having narrower teeth without indented margins, and from *Pomacentrus* in having preopercular and suborbital margins entire (not serrated).

A single species is known.

NEXILOSUS LATIFRONS (Tschudi)

CASTAÑETA; SARGO DE PENA; COCO; COQUITO

Pomacentrus latifrons TSCHUDI, 1845, p. 17, Huacho, Peru (original description).

Nexilosus albemarleus HELLER and SNODGRASS, 1903, p. 204, pl. 8, Galápagos Islands (original description).—SNODGRASS and HELLER, 1905, p. 391, Tagus Cove, Elizabeth Bay and Iguana Cove, Albemarle Island, Galápagos.

Nexilosus latifrons EVERMANN and RADCLIFFE, 1917, p. 121, Mollendo, Guañape North Island, and Lobos de Afuera, Peru (synonymy; description; range).—NICHOLS and MURPHY, 1922, p. 511, South Chincha Island, Peru.

Head 3.0 to 3.5; depth 1.8 to 2.0; D. XIII, 17 to 19; A. II, 13 or 14; P. 20 to 22; scales (vertical series along middle of side) 28 or 29; vertebrae 26.

Body rather short, deep, compressed, its greatest thickness somewhat less than half the depth; back elevated; dorsal outline anteriorly scarcely more convex than the ventral; caudal peduncle short, deep, 1.7 to 2.2 in head; snout short, blunt, 2.7 to 3.1; eye 3.4 to 5.2; interorbital 2.7 to 3.5; mouth small, slightly oblique, terminal, or the upper jaw slightly projecting; maxillary almost wholly concealed under preorbital, usually not quite reaching vertical from anterior margin of eye, 3.3 to 3.7 in head; teeth in each jaw in a single close-set series, narrow at base, but slightly broadened at tips, with smooth and generally rounded margins; gill membranes slightly connected, free from isthmus; gill rakers short, 11 or 12 on lower and 4 or 5 on upper limb of first arch; preopercle unarmed, its posterior margin nearly vertical; suborbital adnate to cheek for a short distance behind maxillary, but posteriorly with free margin; lateral line arched, ending under soft part of dorsal; scales cycloid, deep on side, with accessory scales at base in large examples, reduced on head, extending forward on interorbital, also present on cheek and opercle, and extending on all the fins in the adult, being especially numerous on the vertical fins, quite constantly 4 rows between lateral line and first dorsal spine; dorsal fin continuous, the third to fifth spines generally longest, rather variable in length, 2.1 to 3.2 in head, soft part elevated anteriorly, with acute lobe, 1.2 to 1.5 in head; caudal forked, both lobes broadly rounded, the upper the longer, nearly as long as head; anal similar to soft part of dorsal, its anterior lobe a little less acute and generally scarcely as high, the spines strong, the second 2.1 to 3.0 in head; ventral inserted a short distance behind pectoral, 1.1 to 1.3 (without filament) in head; pectoral broad, generally only slightly shorter than head, 3.4 to 4.1 in length.

General color of preserved specimens dark brown, some specimens being darker than others; side above vent with a partial pale bar, missing in some specimens; margin of scales and margin of opercle very dark; fins in general darker than body. Small specimens, 70 to 75 mm. long, have pale green spots on anterior part of body and on opercle. No specimen less than 140 mm. long has a pale bar on side, and it is missing in some of the large ones, too.

The color "in life" of a specimen 203 mm. long from Mollendo, was described (presumably from R. E. Coker's field notes) as follows by Evermann and Radcliffe (see reference above): "Back and sides a very dark brownish olive, each scale with a very dark margin, lighter centrally; a bright bar of dusky gold extending incompletely across body a short distance before anterior end of anal; fleshy flaps margining opercle very dark; soft parts of fins black; throat and lower parts of head light chestnut brown."

The Mission furnished 23 specimens. Six specimens, including 3 juveniles, collected by R. E. Coker also were examined. The enumerations and proportions used in the description are based on 16 specimens, 70 to 265 mm. (50 to 208 mm. to base of caudal) long. The smaller specimens differ from the large ones, in addition to color already mentioned, in having the fins less densely scaled, in having the edges of the scales rough, and in having a proportionately larger eye and narrower interorbital as usual among young fish. The 3 juveniles, respectively 18, 19, and 19 mm. long, described by Evermann and Radcliffe (see reference above) as having the preopercle "strongly serrate" is scarcely correct, as the margin consists of a rough membranous (not bony) edge. Neither is there any indication of a serrated bony edge in specimens 70 to 73 mm. long, which are next smallest in size among the specimens at hand. The condition as to the adherence of the suborbital is not different in the young from that of the adult. The number of dorsal spines, and the rows of scales are remarkably constant among specimens.

The Peruvian examples were compared with three large ones from the Galápagos Islands, identified as *Nexilosus albemarleus* Heller and Snodgrass, with which they quite certainly are identical. This confirms the view already reached by Evermann and Radcliffe (see reference above) from the study of the description and figure of *N. albemarleus* in connection with Peruvian specimens.

The specimens collected by the Mission, taken mostly with trammel nets set near rocks, are from Paita Harbor, and Bay; Lobos de Tierra Bay; Lobos de Afuera Bay; Guañape Island; Samanco Bay, off Mount Campaña; Pachacamac Island; and North Chincha Island. The ones collected by R. E. Coker are from Lobos de Afuera, Guañape Island, and from Mollendo.

It is stated in the report of the Mission (1943, p. 278) that "castañeta" is the "commonest of the Peruvian rock fishes" yet of comparatively little economic importance, because it is not highly esteemed as a food fish. The largest examples observed by the Mission were only about 350 mm. long.

Range.—Entire coast of Peru, and at least as far south as Iquique, Chile. The species occurs also in the Galápagos Islands.

Family LABRIDAE [21]

Body oblong or elongate, more or less compressed; mouth moderate, generally terminal; lips thick, the lower one usually with a lateral flap; premaxillaries protractile; maxillary slipping under preorbital;

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[21] Jordan (1923, pp. 221, 222) divided the family Labridae, as formerly understood, into two families, namely, Labridae and Coridae. The family Labridae was defined as including those fishes inhabiting "the colder seas" and having 27 or more vertebrae. The family Coridae was to include the "tropical forms" having 25 or fewer vertebrae. As the vertebrae apparently have not been counted in many species, it is not at all certain that the division based on the number of vertebrae is tenable. Furthermore, all the species of the genera listed under Labridae by Jordan do not inhabit the colder seas, and on the other hand some of the species of the genera listed under Coridae range well into temperate regions. Accordingly, I am not ready to follow the division made by Jordan and have included the genera *Halichöres* and *Pseudojulis*, placed with the Coridae by Jordan, back with the Labridae.

teeth in jaws strong, separate or coalesced at base, never forming a continuous plate, anterior teeth usually caninelike, none on vomer or palatines; lower pharyngeal bones united, with conical or blunt teeth; nostrils with 2 openings on each side; gills 3½, slit behind last one small or obsolete; gill membranes somewhat connected, sometimes joined to isthmus; lateral line continuous or interrupted, sometimes abruptly bent downward; dorsal fin continuous, with 3 to 20 slender spines; anal more or less similar to soft part of dorsal, with 2 to 6 spines; ventral inserted below pectoral, with 1 spine and 5 soft rays.

KEY TO THE GENERA

a. Dorsal with 12 spines; lateral line without abrupt curve.
  b. Scales large, about 30 to 35 in a longitudinal series and 4 or 5 rows between lateral line and first dorsal spine---------------------**Bodianus** (p. 343)
  bb. Scales smaller, about 50 to 60 in a longitudinal series, and 8 or 9 rows between lateral line and first dorsal spine---------**Pimelometopon** (p. 346)
aa. Dorsal with 9 spines; lateral line abruptly curved downward under posterior rays of dorsal.
  c. A strong canine tooth present in posterior part of upper jaw, near angle of mouth--**Halichöres** (p. 347)
  cc. Canine tooth in posterior part of upper jaw missing---**Pseudojulis** (p. 349)

Genus BODIANUS Bloch, 1790

Body rather robust; back moderately elevated; head rather pointed; mouth large, nearly or quite terminal; each jaw anteriorly with 2 to 4 enlarged caninelike or somewhat incisorlike teeth; upper jaw posteriorly with a rather strong canine; other teeth smaller, more or less coalesced at base; lateral line complete, without abrupt curve; scales large, about 30 to 35 in a longitudinal series and 4 or 5 rows between the lateral line and first dorsal spine; dorsal with about 12 rather low spines; anal with 3 rather strong spines, its soft part similar to that of dorsal, with some of the middle rays produced in adults; ventrals inserted below base of pectorals.

KEY TO THE SPECIES

a. Body moderately elongate, its depth 2.75 to 3.0 in length; 12 or 13 gill rakers on lower limb of first arch; enlarged teeth in anterior part of each jaw little, if at all, compressed, caninelike; color light brown; side with a dark longitudinal band in females, missing in large males--**diplotaenia** (p. 343)
aa. Body rather deeper, its depth 2.4 to 2.7 in length; 9 or 10 gill rakers on lower limb of first arch; enlarged teeth in anterior part of each jaw compressed, incisorlike; color dark brown to nearly black; no dark band on side. **eclancheri** (p. 345)

BODIANUS DIPLOTAENIA (Gill)

GALLO

Harpe diplotaenia GILL, 1862, p. 140, Cape San Lucas, Baja California (original description).

Bodianus diplotaenia EVERMANN and RADCLIFFE, 1917, p. 124, Lobos de Afuera, Peru (synonymy; description; range).—MEEK and HILDEBRAND, 1928, p. 712, Panama Bay (synonymy; description; range).

Head 3.15; depth 2.8; D. XII, 11; A. III, 12; P. 17; scales 32.

Body moderately compressed, its greatest thickness about two-fifths of its depth; back moderately elevated; profile nearly straight over snout, convex over eyes to dorsal; head longer than deep; caudal peduncle long, rather deep and compressed, 2.0 in head; snout long, rather pointed, 2.5 in head; eye small, 6.25; interorbital 3.5; mouth slightly oblique, terminal; maxillary failing to reach eye, 2.8 in head; teeth in a single series in each jaw, upper jaw anteriorly with 4 large canines, followed by small, somewhat coalesced teeth, posteriorly with a moderately strong canine directed forward, lower jaw anteriorly with 2 rather large canines, followed by coalesced teeth, more nearly separate and caninelike posteriorly; gill rakers small, 12 on lower and 6 smaller ones on upper limb of first arch; lateral line following contour of back more or less, reaching middle of side on caudal peduncle; scales large, with membranous borders, not quite extending forward to interorbital, extending on bases of soft parts of dorsal and anal, 4 complete rows between lateral line and first dorsal spine; dorsal fin long, the spines graduated, the last one about twice length of eye; soft part of dorsal elevated, the fifth and sixth rays produced, exceeding length of pectoral; caudal deeply concave, the upper lobe notably the longer, little shorter than head; anal slightly injured, similar to dorsal, third spine 3.8 in head; ventral inserted under base of pectoral, the two outer rays moderately produced (slightly injured); pectoral broadly rounded, not quite reaching vertical from vent, 1.4 in head.

Color of old preserved specimen rather light brown above; pale underneath; a dark band along middle of side, divided into two indefinite narrow bands on head; margins of scales dark brown on side and back; anterior rays and bases of soft dorsal and anal dark brown, the rest of fins pale; caudal brown at base, outer rays brown, the rest of fin pale; ventral slightly dusky; pectoral pale, its upper rays distally black.

The foregoing description is based on a female, 335 mm. (255 mm. to base of caudal) long, taken at Lobos de Afuera, Peru, by R. E. Coker, the only specimen now at hand from Peru. Several examples from Panama Bay, Cocos Island, and Socorro Island are available for comparison. The following proportions are based on five specimens from Panama Bay and two from Cocos Island, 255 to 480 mm. (205 to 343 mm. to base of caudal) long: Head 3.0 to 3.3 in length; depth 2.75 to 3.0. Eye 5.3 to 6.5 in head; snout 2.25 to 2.6; maxillary 2.6 to 2.9; ventral 1.1 to 1.5; pectoral 1.25 to 1.4. D. XII, 10 or 11; A. III, 12 or 13; P. 17; gill rakers 12 or 13 (on lower limb); scales 4–33 or 34; vertebrae 27 (one specimen dissected).

The color pattern of the females from Panama and Cocos Island is essentially like that of the Peruvian example, though a few of the specimens are considerably darker, with correspondingly darker fins. The two large males among the Panama material and one from Socorro Island differ in color only in the absence of the dark longitudinal stripe on the side. Large males have a pronounced fleshy pad on the head over the eyes. In large examples, whether male or female, the outer rays of the caudal and the lobes of the dorsal and anal become very long, often exceeding the length of the head, the lobes of the dorsal and anal reaching well beyond base of caudal. The outer rays of the ventral, too, become much elongated, sometimes reaching origin of anal. The usual number of enlarged teeth anteriorly in each jaw is four above and four below, and they are scarcely compressed in any individual examined, being rather strictly canine-like.

Range.—Baja California to Peru. Reported also from the Galápagos Islands.

BODIANUS ECLANCHERI (Valenciennes)

VIEJA; VIEJA NEGRA; VIEJA COLORADA; LOBEROS

Cossyphus eclancheri VALENCIENNES, 1855, p. 340, Galápagos Islands (original description).

Bodianus eclancheri EVERMANN and RADCLIFFE, p. 1917, 125, Lobos de Afuera, Peru (synonymy; description; compared with *B. diplotaenia;* discussion of common names).—NICHOLS and MURPHY, 1922, p. 511, Lobos de Afuera, Peru.

Head 3.0 to 3.3 in length; depth 2.4 to 2.7; pectoral 3.9 to 4.25; eye 4.8 to 5.5 in head; snout 2.6 to 2.8; interorbital 2.9 to 3.7; maxillary 2.6 to 3.0; caudal peduncle 1.6 to 1.8; third anal spine 2.9 to 3.3; ventral 1.1 to 1.25; pectoral 1.2 to 1.4. D. XII, 11 or 12; A. III, 11 or 12; P. 17; gill rakers 9 or 10 on lower limb; scales 4–33 or 34; vertebrae 27 (one specimen dissected).

The foregoing proportions and enumerations are based on four specimens, 130 to 245 mm. (106 to 202 mm. to base of caudal) long, taken by the Mission in rocky places in Paita Harbor, Lobos de Tierra Bay and Lobos de Afuera Bay. These specimens are so closely related to those already described as *B. diplotaenia* that it seems necessary to point out only the differences noticed. The most prominent one is the much darker color, the four specimens of *B. eclancheri* being uniformly dark brown, varying little among themselves, only one being a little lighter brown than the others. The fins, too, are quite dark, only the basal part of the pectoral being olivaceous in the three dark specimens. In the somewhat lighter specimen most of the pectoral and the caudal are somewhat olivaceous. According to the accounts offered by Evermann and Radcliffe (see reference above), some specimens are marked with a black bar on the head, which is not evident in any specimen at hand. In the report of the Mission (1943, p. 22) black individuals, red and brown ones, and partly orange, yellow, and white ones are mentioned.

These "color phases" form the basis for the several local names. It is possible, however, that both species are included under the names given, and that all the colors mentioned do not apply to one species.

The body apparently is a little deeper than in *B. diplotaenia*, as shown by the proportions offered. It seems probable, also, that the number of gill rakers on the lower limb of the first arch and the average number of anal rays may be slightly lower. Comparing specimens of equal size (those of *B. diplotaenia* being from Panama) of the limited material now available, it appears that the lobes of the dorsal, anal, and caudal are less produced in *B. eclancheri* and that the ventral fins are rather longer. However, there is variation in these characters among the specimens of each species.

Although Evermann and Radcliffe (see reference above) stated that the teeth in the two species here compared are "essentially the same," the specimens now at hand differ noticeably, *B. eclancheri* having the enlarged teeth in the jaws flattened, incisorlike, whereas they are little, if at all, flattened but rather strictly caninelike, in *B. diplotaenia.* The specimens of *B. eclancheri,* examined by Evermann and Radcliffe, unfortunately, are not available at present.

It is evident from the foregoing comparisons that *B. diplotaenia* and *B. eclancheri* are closely related but that not enough specimens are now at hand to determine the exact relationship.

According to the report of the Mission (1943, p. 279) this species is of limited commercial importance. *B. diplotaenia* and *Pimelometopon darwinii,* which are not mentioned among the commercial species, may make up part of the catch, as these related species, all living in rocky places, probably are not separated for the market.

Range.—Northern Peru and the Galápagos Islands.

Genus PIMELOMETOPON Gill, 1864

This genus differs from *Bodianus* chiefly in having smaller scales, there being about 50 to 65 in a longitudinal series and 8 or 9 rows between the lateral line and first dorsal spine.

A single species is known from Peru.

PIMELOMETOPON DARWINI (Jenyns)

MULATA; VIEJA COLORADA

Cossyphus darwini JENYNS, 1842, p. 100, pl. 20, Chatham Island, Galápagos (original description).

Pimelometopon darwinii ABBOTT, 1899, p. 359 (no locality, synonymy only).—EVERMANN and RADCLIFFE, 1917, p. 127, Lobos de Afuera, and Mollendo, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 511, North Chincha Island and Lobos de Tierra Island, Peru.

Head 3.0 to 3.15; depth 2.8 to 3.0; D. XII, 10; A. III, 11 or 12; P. 18; scales 53 to 56.

Body moderately compressed, its greatest thickness about half its depth; back elevated; dorsal outline anteriorly more strongly convex than the ventral; caudal peduncle much compressed, 2.1 to 2.15 in head; snout only moderately pointed, 2.4 to 2.5; eye 5.5 to 5.8; interorbital 3.3 to 3.9; mouth terminal; each jaw anteriorly with 4 large canines, followed laterally by smaller, partly coalesced teeth, the upper jaw with a moderately large canine posteriorly, near angle of mouth; gill rakers small, 12 more or less developed on lower and 6 to 8 still smaller ones on upper limb of first arch; lateral line following the general contour of back, attaining middle of side under last rays of dorsal; scales rather small, with slightly crenulate, membranous margins, extending on nape, opercle, and cheek, encroaching somewhat on base of caudal, but not on the other fins, 8 or 9 complete rows between lateral line and first dorsal spine; dorsal fin long, the spines moderately strong, graduated, the last 3.2 to 3.6 in head; soft part of fin much higher, its outer margin rounded; caudal rather short, the middle rays about as long as snout and eye, the upper and lower rays somewhat produced, especially in the largest example, the rest of margin nearly straight; anal with a few of the middle rays somewhat produced, forming an acute lobe, the margin posterior to the lobe concave, the spines rather strong, the third 3.2 to 3.6 in head; ventral inserted under base of pectoral, 1.6 to 1.75 in head; pectoral broadly rounded, reaching a little beyond tip of ventral, 1.4 to 1.6 in head, 4.5 to 4.8 in length.

Color brownish, somewhat paler below than on back; a dark shade across nape in two specimens, missing in a third one; fins pale to brownish, the dorsal anteriorly (including the first three or four spines) notably darker than rest of fin, the outer margins of the soft part of dorsal, caudal, anal, and ventral brownish. Evermann and Radcliffe (see reference above), quoting R. E. Coker, state that this species "shows remarkable color variation in life." Some individuals are said to be flaming red; others a somber chocolate, with a reddish tinge only in places.

The description is based on three of the four specimens from Lobos de Afuera and Mollendo, collected by R. E. Coker and reported by Evermann and Radcliffe (see reference above). These specimens, the only ones now at hand, are 250, 267, and 280 mm. (211, 220, and 230 mm. to base of caudal) long. The species is not included in the collection furnished by the Mission.

Range.—Peru and the Galápagos Islands.

Genus HALICHÖRES Rüppell, 1835

Body moderately compressed; head rather pointed; mouth fairly small; teeth strong, in a single series in each jaw, upper jaw with 2 enlarged canines anteriorly, and 1 on side near angle of mouth, lower jaw with 4 strong canines anteriorly; gill rakers poorly developed; lateral line complete, abruptly curved downward under posterior part of dorsal; scales large, fewer than 30 in a lateral series, not extending on head; dorsal with 9 spines; anal with 3; ventral inserted under base of pectoral.

A single species is known from Peru.

HALICHÖRES DISPILUS (Günther)

Doncella; San Pedrano

Platyglossus dispilus Günther, 1864a, p. 25, Panama Bay (original description), *Halichoeres dispilus* Evermann and Radcliffe, 1917, p. 128, San Lorenzo Island. and Santa Rosa Island, Peru (synonymy; description; range).—Nichols and Murphy, 1922, p. 511, North Chincha and Lobos de Afuera Islands.—Meek and Hildebrand, 1928, p. 721, Panama Bay (synonymy; description; range).

Head 3.5 to 4.0; depth 3.5 to 4.4; D. IX, 11; A. III, 12 (rarely 11); P. 12 or 13; scales 26 or 27; vertebrae 24 (three specimens dissected).

Body moderately compressed, its greatest thickness about half its depth; back elevated; dorsal outline anteriorly, especially in small specimens, more strongly convex than the ventral; caudal peduncle much compressed, 1.9 to 2.3 in head; snout pointed, increasing in proportionate length with age, 2.9 to 4.0; eye small, proportionately, notably smaller in large than in small specimens, 4.0 to 7.2; interorbital 4.7 to 6.1; mouth terminal; maxillary failing to reach anterior margin of eye, 3.5 to 4.4 in head; teeth in each jaw in a single series, upper jaw anteriorly with 2 large canines, sometimes with a rather large tooth on each side of the anterior canines, the lower jaw with 4 large canines anteriorly, the canines in each jaw followed by smaller, partly coalesced teeth, the series in upper jaw ending posteriorly with a rather large canine directed somewhat forward; gill rakers small, about 12 somewhat developed on lower limb of first arch; lateral line close to back, following dorsal outline anteriorly, abruptly decurved to middle of side under last dorsal rays, the pores not branched; scales large, with smooth membranous borders, encroaching slightly on base of caudal, but not on the other fins, 2 complete rows between lateral line and first dorsal spine; dorsal fin continuous, the spines pungent, somewhat graduated, the last one 2.7 to 3.6 in head; soft part of dorsal somewhat longer and higher than the spinous part; caudal broadly convex in the smaller examples, the outer rays slightly produced in large examples; anal similar to soft part of dorsal, the spines weak, the third 3.1 to 3.75 in head; ventral inserted under base of lower rays of pectoral, 1.75 to 2.1 in head; pectoral rather large, reaching well beyond tip of ventral, the third or fourth ray longest, 1.1 to 1.4 in head, 4.2 to 5.7 in length.

Color usually uniform brown above to olivaceous below; rarely with suggestions of dark cross bars on back and sides; a dark blotch on opercle; a small dark spot, often obliquely elongate, situated on the second oblique series of scales behind tip of opercular flap, and on the first and second longitudinal rows of scales below lateral line, another black spot at base of caudal wholly or mostly above lateral line; dorsal dusky, commonly with a very small dark spot at base of second or between bases of second and third soft rays of dorsal; caudal and pectoral slightly dusky; other fins plain translucent.

Many specimens were collected by the Mission. There are at hand also several specimens taken by R. E. Coker. The specimens in the collections are from Lobos de Tierra Bay, Lobos de Afuera Bay, Chimbote Bay, Samanco Bay, Tortuga Bay, San Lorenzo Island, and Santa Rosa Island. The proportions and enumerations used in the description are based on 16 specimens, 33 to 200 mm. (28 to 165 mm. to base of caudal) long. Specimens from Panama Bay, the type locality, seem to agree well with the Peruvian material. Two specimens, 110 and 165 mm. long, from Charles Island and Albemarle Island, Galápagos, collected by W. L. Schmitt, also were compared and seem to be of this species, although it apparently has not previously been reported from the Galápagos Islands.

The proportionately great difference in the size of the eye of the small and the largest specimens examined is remarkable. The measurements indicate that the eye increases little in size, whereas other parts, especially the snout, continue to grow, after a length of about 140 mm. is attained. For example, in a specimen 145 mm. long the eye had a diameter of 5.1 mm., and in one 200 mm. long its diameter was 6.0 mm. In the smaller of these specimens the snout was 10 mm. long, whereas it was 14 mm. in the larger one.

Range.—Gulf of California to Peru and the Galápagos Islands.

Genus PSEUDOJULIS Bleeker, 1861

This genus differs from *Halichöres* principally in the absence of a canine tooth in the upper jaw, near the angle of the mouth. The lower jaw may have two or four enlarged canines anteriorly (the species herein described from Peru has four).

A single species new to the fauna of Peru is included.

PSEUDOJULIS NOTOSPILUS Günther

Pseudojulis notospilus GÜNTHER, 1864a, p. 26, Panama Bay (original description); 1869, p. 447, pl. 66, fig. 2 (description).—MEEK and HILDEBRAND, 1928, p. 725, Panama Bay (synonymy; description; range).

Head 3.6, 3.5; depth 3.6, 3.7; D. IX, 11, IX, 11; A. III, 12; III, 12; P. 13, 13; scales 27, 27.

Body moderately compressed, its greatest thickness about half its depth; back elevated; dorsal outline more strongly convex than the ventral; caudal peduncle much compressed, 1.9, 1.9 in head; snout pointed, 3.3, 3.6; eye 3.3, 3.75; interorbital 5.0, 5.3; mouth small, slightly inferior; maxillary failing to reach anterior margin of eye, 4.5, 4.0 in head; teeth in each jaw in a single series, upper jaw anteriorly with 2 and the lower with 4 canines, these followed laterally by smaller, partly coalesced teeth; gill rakers rather poorly developed, about 9 or 10 on lower limb of first arch; lateral line rather close to back, following dorsal outline anteriorly, abruptly decurved to middle of side under posterior rays of dorsal, some of the pores branched; scales large, with smooth membranous borders, encroaching slightly on base of caudal, but not on the other fins, 2 complete rows between the lateral line and first dorsal spine; dorsal fin continuous, the spines slender, graduated, the last one 2.5, 2.9 in head; soft part of dorsal a little longer, higher than the spinous part, caudal slightly convex; anal similar to soft part of dorsal, but scarcely as high; ventral inserted under base of pectoral, 1.9, 1.8 in head; pectoral broadly rounded, 1.4, 1.3 in head.

Color pale olivaceous, scarcely darker above than below; a small, vertically elongate spot immediately behind eye; a dark blotch on opercle; an indefinite dark bar under anterior spines of dorsal, extending on the fin; several other indefinite dark markings on side and back; a rather large black spot on base of anterior soft rays of dorsal with a slight bar on back and side below it; dorsal fin (except for the black spot and the dark anterior spines), caudal, and pectoral olivaceous; anal and ventral somewhat dusky.

The description is based on the only specimens, two young adults, 45 and 50 mm. (36 and 41 mm. to base of caudal) long, in the Peruvian collections. These were secured by the Mission in a small rocky cove on Lobos de Afuera Island. Numerous specimens from Panama Bay, and one from Gorgona Island, Colombia, are before me for comparison. The following proportions and enumerations are based on 15 specimens, 40 to 135 mm. long, from the last mentioned localities: Head 3.5 to 4.0 in length; depth 3.3 to 4.0; pectoral 4.5 to 5.3. Eye 4.0 to 5.0 in head; snout 2.65 to 4.75; maxillary 3.2 to 4.8; pectoral 1.2 to 1.4. D. IX, 11; A. III, 12; P. 13; scales 2–26 or 27; vertebrae 24 (two specimens dissected). Except for the absence of a canine tooth in the posterior part of the upper jaw, and a difference in color, this species is strikingly close to *Halichöres dispilus*.

Range.—Gulf of California to northern Peru. Previously reported from only as far south as Panama Bay.

Family SCARIDAE: Parrotfishes

Body oblong, more or less compressed, generally rather robust; mouth terminal or nearly so; lips not thickened, the upper one often double at least laterally; teeth in jaws coalesced, at least at base, usually forming a continuous plate, with or without one or more free canines above the cutting edge; no teeth on vomer or palatines; lower pharyngeals large, usually forming a more or less definite quadrangle; scales large, cycloid, about 23 to 26 in a lateral series; dorsal fin continuous, usually with 9 spines and 10 soft rays, the spines often weak and flexible; anal with 3 spines and usually with 9 soft rays; ventral fins thoracic.

KEY TO THE GENERA

a. Teeth in jaws fully coalesced, forming a continuous cutting edge; gill membranes narrowly united or separate______________________**Scarus** (p. 351)

aa. Teeth in jaws not fully coalesced, the cutting edge irregular, formed by individual teeth; gill membranes broadly united_______**Xenoscarus** (p. 354)

Genus SCARUS Forskål, 1775

Body elongate, compressed, moderately robust; head rather short and blunt; mouth moderate or small, lower jaw included; upper lip laterally double, usually becoming narrow or disappearing anteriorly; teeth in the jaws fully coalesced, forming a continuous cutting edge, with an evident median suture, with or without free lateral canines; lower pharyngeals generally considerably longer than broad, concave; upper pharyngeals separate, with a large and a small row of teeth; gill membranes scarcely united to the isthmus; lateral line interrupted posteriorly, commencing again lower down on middle of side, the pores usually branched; dorsal with 9 flexible spines, and about 10 soft rays; anal with 3 flexible spines and about 9 soft rays.

A single apparently new species is included in the collections studied.

SCARUS DUBIUS, new species

FIGURE 72

Head 3.0 to 3.25; depth 3.0 to 3.3; D. IX, 10; A. III, 9; P. 14; scales 24 or 25; vertebrae 24 (one specimen dissected).

Body moderately compressed, its greatest thickness about half its depth; dorsal outline gently depressed over nostrils, elsewhere convex; caudal peduncle rather long, compressed, 1.9 to 2.3 in head; snout moderately long, 2.9 to 3.4; eye small, placed high, 3.9 to 4.3; interorbital rather broad, only gently convex in cross section, 3.1 to 3.4; mouth small, placed below level of lower margin of eye, nearly terminal, with the lower jaw only slightly included; upper lips double throughout (the inner one becoming narrow anteriorly in the largest specimen in the collection); maxillary hidden under skin of preorbital, failing to reach vertical from anterior margin of eye, 4.2 to 4.75 in head; teeth in jaws white, quite fully coalesced, the cutting edges scarcely indented, without canines; lower pharyngeal plate scarcely longer than broad, more or less oval in shape, though slightly reduced in width and somewhat angulate anteriorly, its surface distinctly concave, its teeth very broad on posterior half or so of plate, not distinctly outlined anteriorly and on center of plate; upper pharyngeal plates each with a series of very broad teeth (a second series not definitely visible in the small example dissected); gill membranes narrowly united; lateral line interrupted on first or second oblique series of scales behind dorsal fin, resumed lower down on caudal peduncle, on the same series of scales or on one series farther forward; scales large, those on base of caudal largest, extending forward on interorbital space to about middle of eye, three to five scales on median line in advance of dorsal, five in advance of ventrals, and two between bases of ventrals, one complete row and a partial row between lateral line and first dorsal spine, two rows on cheek, slightly embedded, each row usually with five scales (one of eight specimens with six scales in upper row, and two with four scales in lower row); lower posterior margin of opercle with seven or eight scales, including the large one at posterior angle; dorsal fin continuous, the spines only moderately flexible, but not pungent; soft part of dorsal anteriorly a little higher than spinous part; caudal broadly convex; anal similar to soft part of dorsal, its origin a little in advance of middle of dorsal; ventral inserted under base of pectoral, its margin convex, the innermost ray about three-fourths length of the first divided ray, the second divided ray longest, 1.75 to 2.1 in head; pectoral broadly rounded, the upper rays longest, the lower ones decreasing gradually in length, the shortest ray about half the length of the longest, the longest rays reaching somewhat beyond tip of ventral, 1.3 to 1.6 in head, 4.3 to 4.9 in length.

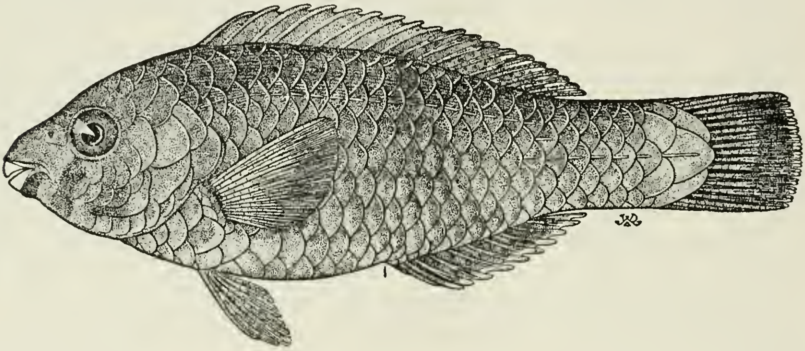

FIGURE 72.—*Scarus dubius*, new species. From the type, 85 mm. long, Lobos de Afuera Bay, Peru (U.S.N.M. No. 128113).

Color dark grayish brown above, pale gray below; some specimens lighter than others; light colored specimens with indefinite dark stripes along the rows of scales on lower part of side; a dark band extending across chin from one angle of mouth to the other, followed by two short dark bands on lower part of head, generally not meeting ventrally, the last one scarcely more than a blotch in some specimens; pectoral with a narrow dark band at base, the fin otherwise plain olivaceous; the other fins dusky gray, variously marked with pale and dark specks; margins of caudal and anal pale.

This species is represented in the collection made by the Mission by eight specimens, 40 to 85 mm. (30 to 68 mm. to base of caudal) long, all taken in shallow water in Lobos de Afuera Bay. The largest specimen (U.S.N.M. No. 128113) has been selected as the type. The following proportions and enumerations are based on the type: Head 3.25 in length; depth 3.0; ventral 5.6; pectoral 4.5. Eye in head 4.3; snout 3.0; interorbital 3.1; maxillary 4.2; caudal peduncle 1.9; ventral 1.75; pectoral 1.4. D. IX, 10; A. III, 9; P. 14; scales in lateral series 25, one complete and a partial row between lateral line and first dorsal spine, six scales in upper row on cheek, five in lower row, eight along margin of opercle below angle (including scale at angle), four before dorsal, and five before ventral.

The Peruvian examples seem to be closely related to *S. azureus* Meek and Hildebrand (1928, p. 742, pl. 72, fig. 1), which is known only from the type (U.S.N.M. No. 81778) from Panama Bay. Upon comparison of specimens, several differences were noticed. Some, but not all, of the differences may be ascribed to a difference in age or size, as the Panama fish, having a length of 200 mm., is much larger. The name *dubius* is offered because the meager material available leaves the exact relationship of the two species in doubt. The following comparison shows the differences noticed:

S. azureus	*S. dubius*
Pectoral rather narrow, the rays decreasing rapidly in length, the lowermost one about a third the length of the longest one, with 15 rays.	Pectoral broad, the rays decreasing more gradually in length, the lowermost one half the length of the longest one, with 14 rays.
Ventral fin long, 1.6 in head, 5.2 in length; first (outermost) divided ray a little longer than the second; last ray about half the length of first.	Ventral fin shorter, 1.75 to 2.2 in head, 5.9 to 6.6 in length; second divided ray a little longer than the first (outermost) one; last ray about three-fourths of first.
Scales on median line before dorsal 5.	Scales on median line before dorsal 3 in 1 specimen, 4 in 6, and 5 in 1.
Scales on cheek in 3 rows, the 2 uppermost rows each with 6 scales, the third with 1 scale.	Scales on cheek in 2 rows, uppermost row with 5 scales in 7 specimens, with 6 scales in 1 example.
Scales along margin of opercle below posterior angle 10 (including large scale at angle).	Scales along margin of opercle below posterior angle 8 in 6 specimens, 7 in 2 examples (including large scale at angle).
Gill membranes separate.	Gill membranes narrowly united across isthmus.

Upper lip double laterally only for a short distance.	Upper lip double throughout, the inner one narrow anteriorly in the largest specimen (probably changing with age).
Eye not especially near dorsal outline, very small, 5.6 in head, 2.1 in snout. (Difference shown in this and opposite paragraph probably not significant, because of difference in size of specimens.)	Eye near dorsal outline, larger, 3.9 to 4.4 in head, 1.2 to 1.45 in snout.
Color plain yellowish gray; no dark markings anywhere; fins plain. (No dark markings mentioned in description of fresh specimen, which was bluish.)	Color dark gray above, paler gray below; with dark bar on chin and 2 on lower part of head; pectoral with a dark bar at base; caudal, anal, and ventral with dark spots or specks.

Range.—Known only from Lobos de Afuera Bay, Peru.

Genus XENOSCARUS Evermann and Radcliffe, 1917

Body elongate, compressed, moderately robust; head rather flat above, somewhat conical; mouth moderate; lower jaw included; teeth white, distinctly outlined, in regular oblique series, attached to outer surface of dental plate, the cutting edge not continuous, being formed in part at least of individual teeth; lower pharyngeal plate about 3 times as broad as long; upper pharyngeal plates notably longer than broad; each plate provided with transversely broadened teeth, each tooth with a narrow cutting edge; upper lip double throughout; gill membranes broadly united, and attached to isthmus; lateral line more or less interrupted; dorsal with 9 spines and 10 soft rays, the spines flexible.

A single species is known, which has been recorded only from Peru.

XENOSCARUS DENTICULATUS Evermann and Radcliffe

POCOCHO DE MAR; LORO DEL MAR

Xenoscarus denticulatus EVERMANN and RADCLIFFE, 1917, p. 129, pl. 12, fig. 1, Lobos de Afuera, Peru (original description).

Head 3.3 to 3.6; depth 2.8 to 3.2; D. IX, 10; A. III, 9 (rarely 8); P. 13; scales 24 or 25; vertebrae 24 (one specimen dissected).

Body compressed, rather robust, its greatest thickness nearly half its depth; dorsal and ventral outlines anteriorly about evenly convex; caudal peduncle rather long, 1.9 to 2.3 in head; snout somewhat conical, 2.3 in large examples to 3.2 in small ones; eye 3.5 to 5.7; interorbital flat, 3.2 to 4.0; mouth horizontal; lower jaw included; maxillary not quite reaching eye, concealed under skin of preorbital, 2.7 to 3.3 in head; teeth not fully coalesced, in about five oblique series in each jaw, the individual teeth forming the cutting edge; no free lateral canines; lower pharyngeal plate about three times broader than long, with about eight longitudinal series of greatly broadened teeth with narrow cutting edges; upper pharyngeal plates nearly twice as long as broad, each with three series of teeth like those on the lower plate; gill rakers little developed, some of them branched; lateral line interrupted just behind last ray of dorsal, resumed on middle of caudal peduncle, generally one row of scales in advance of last pore in the main branch; scales large, with membranous margins, extending on base of caudal, last scale in lateral line very large, generally pointed, scales extending forward on head to but not on interorbital, three scales on median line in advance of dorsal, a single row of four scales on cheek, not reduced on chest, three on median line in advance of ventrals, one and a partial row between lateral line and first dorsal spine; dorsal fin continuous, the spines weak and flexible, with short, slender filaments in the larger specimens; soft part somewhat higher than spinous part; caudal rounded at all ages; anal similar to soft part of dorsal, the spines very weak; ventral inserted under base of pectoral, 1.6 to 1.8 in head; pectoral broadly rounded, reaching to, or slightly beyond, tip of ventral, 1.4 to 1.7 in head, 4.9 to 5.8 in length.

Color rather variable, dark gray to rather pale gray above, light gray underneath; scales often darker at base than elsewhere; the smaller specimens often with one or more indefinite light streaks on lower half of side; chin wholly dusky or with only a dark cross bar, followed by two or three dusky cross bars on lower half and ventral side of head; dorsal, caudal, and anal nearly uniform dark gray in the dark specimens, lighter with pale and dark spots in the lighter gray specimens; caudal with a pale margin; ventral wholly or in part dusky gray, occasionally spotted; pectoral dark at base, otherwise plain olivaceous. A few small specimens, under 50 mm. in length, are almost plain olivaceous, only a few dark specks being present.

The collection made by the Mission contains 39 specimens, ranging from 33 to 280 mm. in length. The proportions and enumerations in the description are based on 16 specimens, including the type (U.S. N.M. No. 77619), 45 to 280 mm. (35 to 234 mm. to base of caudal) long. The specimens were taken in Lobos de Tierra Bay, Lobos de Afuera Bay, Don Martín Island, and North Chincha Island.

Range.—Known only from the coast of Peru. Previously known from only two specimens from Lobos de Afuera.

Family MUGILOIDIDAE

Body elongate, more or less compressed; mouth moderate or large, horizontal to somewhat oblique; vomer and sometimes palatines with teeth; scales small; dorsal fin long, continuous anal similar, but shorter; ventrals thoracic, generally somewhat in advance of pectorals; pectoral rays all, or nearly all divided.

A single genus is included in the Peruvian collections studied.

Genus MUGILOIDES Lacepède, 1803

Body very elongate, anteriorly more or less cylindrical, posteriorly compressed; head somewhat depressed; snout long; mouth nearly horizontal; upper lip thick; vomer and palatines with teeth; preopercle unarmed; opercle with a single flat spine; lateral line complete, scales small, mostly ctenoid; dorsal with about 5 to 7 spines, and 25 to 30 soft rays; anal with a weak spine, and about 20 to 25 soft rays; ventral inserted somewhat in advance of pectoral, with I, 5 rays; lower rays of pectoral divided.

One species is known from Peru.

MUGILOIDES CHILENSIS (Molina)

ROLLIZO; BACALAO; CAMOTE; CAMOTILLO

Esox chilensis MOLINA, 1788, p. 394, Chile (original description).

Pinguipes chilensis CUVIER and VALENCIENNES, 1833, p. 457, Valparaiso, Chile (original description, independent of Molina).—STEINDACHNER, 1898, p. 301, Tumbes, Peru, and Talcahuano, Chile.—EVERMANN and RADCLIFFE, 1917, p. 112, Mollendo, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 511, North Chincha Island, Peru.

Head 3.2, 3.2; depth 4.9, 4.4; D. VI, 29, VI, 28; A. I, 25, I, 24; P. 19, 19; scales 113, 116.

Body quite elongate, depressed anteriorly, compressed posteriorly, rather broader than deep at base of pectoral; head broad, somewhat depressed; caudal peduncle compressed, 3.1, 2.8 in head; snout long, somewhat depressed, 2.3, 2.6 in head; eye rather small, placed high, 5.5, 5.6; interorbital flat, 4.2, 3.5; mouth large, nearly terminal, horizontal; upper lip broad, fleshy; maxillary reaching to or a little beyond vertical from anterior margin of eye, 2.3, 2.2 in head; teeth in a band anteriorly in each jaw, the outer series in each jaw more or less enlarged (notably more enlarged in the larger specimen than the smaller one at hand), extending beyond the band posteriorly; vomer with a patch of blunt teeth, extending on palatines; preopercle unarmed; gill rakers little more than tubercles, 11, 10 somewhat developed on lower and 3, 5 on upper limb of first arch; lateral line complete; scales small, ctenoid, becoming smooth anteriorly on back, on chest and abdomen, not extending on head to interorbital, missing on snout, but present on cheek and opercle, extending far on interradial membranes of caudal, and somewhat on base of pectoral; dorsal continuous, the spines short, pungent, covered with heavy skin, graduated, the longest 4.4, 4.8, the soft part of nearly uniform height; caudal with nearly straight margin, the upper lobe slightly acute; anal with a single weak spine, soft part similar, though shorter, to that of dorsal; ventral inserted well in advance of pectoral, fleshy (especially in the smaller specimen), 1.6, 1.7 in head; pectoral broadly rounded, the middle rays longest, reaching beyond tip of ventral, 1.7, 1.2 in head, 5.3, 5.2 in length.

Color grayish, the larger specimen at hand brownish; pale grayish brown underneath; a row of pale obscure spots, irregular in size and shape, situated along lateral line; ventral fins pale, the other fins more or less brownish.

Two specimens, 345 and 425 mm. (293 and 365 mm. to base of caudal) long, are included in the collections from Peru. The smaller one was taken by the Mission in a trammel net at Pachacamac Island, and the larger one was collected by R. E. Coker at Mollendo. The proportions and enumerations pertaining to the smaller specimen are given first in each instance. The smaller specimen has shorter, coarser teeth, and the ventral fins are coated with notably thicker skin.

Range.—Coasts of Peru and Chile.

Family URANOSCOPIDAE: Stargazers

Body elongate, more or less compressed, at least posteriorly; head large, broad, at least partly covered with bony plates; eye small, superior; mouth vertical; maxillary broad, without a supplemental bone; premaxillaries protractile; teeth pointed, present on jaws, vomer, and palatines; gill openings wide; gill membranes nearly separate, free from isthmus; gills 3½, a slit behind the last; branchiostegals six; scales, if present, small; spinous dorsal small or wanting soft dorsal and anal moderately long; caudal round or truncate, not forked; ventral fins jugular, close together each with one spine and five soft rays; pectoral large, broad at base.

A single genus is represented in the collections from Peru.

Genus ASTROSCOPUS Brevoort, 1860

Body robust; head large, more or less flat above, its upper surface with a Y-shaped bone, the arms of the fork reaching forward to interorbital, two roughly triangular or more or less quadrangular naked areas behind and inward from eyes (often depressed in preserved material), marking location of electric organs; anterior nostril in front of eye, round, with fringed margin; posterior nostril with crescent-shaped groove on inner side of eye, its margin fringed; lips fringed; back and sides with scales; two dorsal fins, the first consisting of four or five sharp spines.

A single species, herein recorded from Peru for the first time, comes within the scope of this catalog.

ASTROSCOPUS ZEPHYREUS Gilbert and Starks

Astroscopus zephyreus Gilbert and Starks, *in* Gilbert, 1897, p. 453, pl. 53, fig. 2, and pl. 54, Magdalena Bay, Baja California (original description).—Meek and Hildebrand, 1928, p. 907, Panama Bay (references; description; range).

Head 2.3 to 2.4; depth 3.0 to 3.9; D. V–13 or 14; A. 13 or 14; P. 20 or 21; scales about 75.

Body robust anteriorly, compressed posteriorly; head large, broader than deep, depressed above; snout very short, broad, 5.5 to 6.8 in head; eye 9.0 to 16.5; interorbital 4.2 to 5.2; mouth vertical; lips fringed, the longest fringes fully as long as eye; maxillary nearly twice as broad as eye, 2.2 to 2.5 in head; teeth all pointed, in a rather broad band on upper jaw, on vomer, and palatines, rather larger and in a very narrow band anteriorly in lower jaw, reduced to a single series laterally; anterior nostril round, surrounded by fringes; posterior nostril with a long curved groove on interorbital, abruptly turned forward behind eye, bordered with fringes throughout its length, forming an "eyebrow"; two blunt spines in front of eye entering premaxillary groove, forked portion of the Y on head shorter than rest of Y; gill rakers undeveloped; lateral line ascending from shoulder to base of spinous dorsal, running along base of dorsal fins, descending rather abruptly on caudal peduncle to middle of base of caudal, then curved forward on lower half of base of caudal; many pores on head; scales small, rather irregular, in very oblique series running downward and backward, missing on head, abdomen, and chest; a fold of skin on midline between bases of ventrals and vent; dorsal fins close together, the first with short, stiff, sharp spines, the longest 3.9 to 5.9 in head, its origin over, or slightly behind, base of upper rays of pectoral, its distance from margin of snout 2.8 to 3.0 in length; second dorsal much higher than the first, the longest rays more than twice as long as the longest spines, the margin strongly convex; caudal as long as postorbital part of head in small specimens, rather shorter in large ones, its margin convex in small examples, nearly straight in large ones; anal long, highest posteriorly, its origin about under that of second dorsal, its base extending well beyond that of second dorsal, 1.3 to 1.4 in head; ventrals close together, inserted on isthmus, far in advance of pectorals, the inner ray longest, 1.15 to 1.25 in head; pectoral large, reaching well beyond origin of anal, often nearly as long as head, 2.75 to 3.0 in length.

Color grayish above; dirty white underneath; lower part of side glistening silvery gray in the small specimens; upper surface of head and back to end of second dorsal with many pale round spots, some of the largest ones surrounded by dark rings; chin largely dusky to black, more conspicuous in small specimens than in large ones, spinous dorsal black; second dorsal pale, with a dark blotch on outer two-thirds anteriorly, and another posteriorly; caudal with alternating dark and pale horizontal bands; anal and pectoral somewhat dusky, the former quite dark at base, the margin pale in small specimens; ventral pale.

This species is represented in the collection made by the Mission by four specimens, a large one 300 mm. (232 mm. to base of caudal) long, from Cabo Blanco, taken with a trammel net, and three small ones, respectively 85, 88, and 91 mm. (64, 67, and 68 mm. to base of caudal) long, from Sechura Bay, caught in an otter trawl. These specimens were compared with two from Panama Bay, with which they seem to agree. The small specimens are proportionately deeper, the head is less quadrangular, the caudal fin is rounder, and the color markings, particularly the black on the chin and on the fins, are more distinct.

Range.—Gulf of California to northern Peru. Previously apparently not reported from south of Panama.

Family GEMPYLIDAE: Snake Mackerel; Escolares

Body elongate, more or less compressed; head large, compressed; mouth moderately large; lower jaw projecting; teeth strong; gill openings wide, the membranes not united and free from the isthmus; gills 4, a slit behind the fourth; opercles unarmed in adults; lateral line various, sometimes obsolete; scales minute; dorsal fin long, with a notch or space between the spines and soft rays, often followed by finlets; caudal forked; anal similar to soft dorsal; ventral thoracic, often small.

The fishes of this family occur in the high seas and descend to considerable depths. A single genus and species has been reported from northern Peru.

Genus XENOGRAMMA Waite, 1904

"Body fusiform, moderately elongate, somewhat compressed, rounded below. Head conical, compressed behind, preopercle unarmed, branchiostegals seven, gill rakers rudimentary, jaws nearly equal, with strong sharp teeth, much larger and fang-like in the mandible; vomer and palatines toothed, tongue smooth. The first dorsal fin low, uniform with about nine weak spines, not widely separated from the soft portion, the anterior lobe of which is well developed; six finlets. Anal fin with two spines and five finlets. Ventrals moderate, thoracic; no detached spine behind vent; pectorals sub-median. Tail well developed, strongly keeled. Scales small thin cycloid adherent, with scalelets, no corselet. Lateral line remarkably tortuous; vertebrae about thirty." (Waite, 1904, p. 157.)

XENOGRAMMA CARINATUM Waite

Xenogramma carinatum WAITE, 1904, p. 158, Lord Howe Island, Australia (original description; discussion of relationship).—NICHOLS and LA MONTE, 1943, p. 50, 25 miles off Cabo Blanco, Peru (discussion; description; references).

"Depth in standard length, 4.5 (est.); head, 3.6. Eye in head, 5.6; snout, 2.5; interorbital, 3.6; maxillary, 2.3; pectoral, 1.8; ventral, 2.4; height of dorsal and anal lobes (center), 2.6; upper caudal lobe, 1.4½; lower caudal lobe, 1.6.

"Maxillary to under front of pupil. Gill-rakers obsolete. Tongue broad, free, smooth. A row of sharp, pointed teeth in the jaws, those in the lower jaw and an inner row in the front of upper jaw of three on a side, somewhat larger; a single row of well spaced similar teeth, about as large as, or larger than those on the sides of the upper jaw and about 9 in number, in a curve across the vomer, and on each palatine.

"Spinous dorsal weak and low, depressible in a deep slot; anal well behind soft dorsal, its origin under hind rays of same; 6 finlets above and 5 below, the first above scarcely separated from dorsal fin. Uniform small scales over body, their edges covered by smaller to minute scales, and there are also numerous scattered round, dark pores; peduncular keel well developed, wide with a rather thin edge, scaled to the edge.

"In preservative the color of head, back and fins is dusky, sides and lower parts only relatively paler. In a photograph of the fish when caught, the sides are paler. Centers of scales tend to be dark with paler borders, suggesting stippling." (Nichols and La Monte, 1943, p. 50.)

The foregoing description was based on a specimen 1,220 mm. (1,045 mm. to base of caudal) long taken by Michael Lerner 25 miles off Cabo Blanco, in "over 100 fathoms." No specimens are included in the collections studied. Nichols and La Monte say, "The fish is familiar to the Peruvian fishermen, and its flesh is reputed to have the same purgative quality for which that of *Ruvettus* is well known."

Range.—Australia, Japan, Hawaii, California, Peru, and probably elsewhere. Usually living in rather deep water.

Family TRICHIURIDAE: Hairtails; Cutlassfishes

Body very elongate, strongly compressed, band-shaped, tail tapering to a point; head long, rather low, pointed; mouth large; lower jaw projecting; premaxillaries not protractile; gill membranes separate, free from the isthmus; gills 4, a slit behind the fourth; teeth in jaws large, unequal; lateral line continuous; scales wanting; dorsal very long, caudal fin wanting; anal composed of very short separate spines; ventrals rudimentary or wanting; pectoral small. A single genus is represented in the collections from Peru.

Genus TRICHIURUS Linnaeus, 1758

The absence of ventral fins characterizes the genus sufficiently.

TRICHIURUS NITENS Garman

Trichiurus nitens Garman, 1899, p. 69, *Albatross* stations 3354 and 3389, near Trujillo, Peru (original description; compared with *T. lepturus* of the Atlantic).—Breder, 1936, p. 12, Baja California (compared with *T. lepturus* of the Atlantic).—Hubbs and Hubbs, 1941, p. 29, San Pedro, Calif. (relationship of this species and *T. lepturus* discussed).

Trichiurus lepturus Meek and Hildebrand (in part not of Linnaeus), 1923, p. 328, Panama, etc. (synonymy; description; comparison of specimens from Atlantic and Pacific; range).

Head in total length 8.0 to 8.1; depth 16.0 to 19.0; D. 121 to 126; A. 96 to 100; P. 10 or 11.

Body very compressed, anterior half of body fairly uniform in depth, tapering into a filamentous tail, its width nowhere greater than about a third of its depth; head large, compressed; snout long, pointed, 2.7 to 3.1 in head; eye 5.3 to 6.0; interorbital 7.5 to 7.8; mouth large; lower jaw strongly projecting, maxillary slipping under preorbital, extending about to anterior margin of pupil, 2.55 to 2.7 in head; teeth in jaws large, unequal, compressed, largest in anterior part of upper jaw, these received in pits in lower jaw, with a barb posteriorly near tip, palatines with a very narrow band of villiform teeth, none on vomer; gill rakers short, slender, uneven, 9 to 13 more or less developed on lower and 7 or 8 on upper limb of first arch; lateral line curved downward anteriorly, becoming straight near tip of pectoral, running low on side; dorsal fin beginning a very short distance behind eye and occupying nearly the full length of back, becoming very low posteriorly, the rays becoming mere points within a narrow membrane, longest rays near middle of fin, fully as long as snout; distance from tip of snout to origin of dorsal 1.35 to 1.5 in head; anal composed of short detached spines, the anterior ones directed backward, the posterior ones forward, and some of the intermediate ones with both an anterior and a posterior point; pectoral small, 2.6 to 3.2 in head.

Body uniform bright silvery; top of head and tip of lower jaw brownish; dorsal fin pale, with a dusky margin; pectoral pale at base, distally dusky.

The Mission secured four specimens, three respectively 365, 435, and 440 mm. long, and the fourth and largest one with part of the tail missing, all from the Gulf of Guayaquil, off Puerto Pizarro. This species is very close to *T. lepturus* of the Atlantic, apparently differing only in having a smaller average number of dorsal rays, a somewhat shorter maxillary, and a slightly larger eye in proportion to length of snout. That the dentition is weaker in Pacific specimens, as stated by Hubbs and Hubbs (1941, p. 30), is not evident from specimens compared by me.

Range.—Southern California to northern Peru. Previously known from Peru only from the type from off Trujillo.

Family SCOMBRIDAE [22]: Mackerels

Body rather elongate, not much compressed, usually fully streamlined; caudal peduncle slender, often depressed, and with a lateral keel; head moderate, pointed; mouth large; premaxillaries not protractile; maxillary sometimes concealed by preorbital; jaws with large or small, sharp teeth; vomer and palatine teeth sometimes present; gill openings wide, the membranes separate and free from the isthmus; gills 4, a slit behind the fourth one; gill rakers long or short, few to rather numerous; scales small, sometimes present only in pectoral region, often forming a corselet; dorsal fins 2, the first composed of rather slender spines, depressible in a groove; second dorsal and anal similar, more or less elevated anteriorly, each followed by about 5 to 10 finlets; caudal very broadly forked; ventral fins thoracic, each with I, 5 rays; pectorals variable, long or short.

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[22] This family was divided by Kishinouye (1923) into four groups, or families, namely, Scombridae, Cybiidae, Thunnidae, and Katsuwonidae, the classification being based largely on internal characters (anatomy). As difficult dissections are involved, and as some of the characters are scarcely usable except by an expert, I am following the old classification, that is, reuniting all the groups under one family. This seems especially desirable inasmuch as the present paper is expected to be usable by some who are not specialists. If the student wishes to follow the classification cited, he is referred to the paper by Kishinouye, or he may turn to a paper by Jordan and Hubbs (1925), which also contains Kishinouye's classification, and to Jordan, Evermann, and Clark (1930, pp. 256, 257) who took the genus *Acanthocybium* away from the Cybiidae, as understood by Kishinouye, and set up the family Acanthocybiidae for it.

Six genera are represented in the collections at hand from Peru. Two others, *Auxis* and *Acanthocybium*, each represented by a single species (*A. thazard*, the frigate mackerel, and *A. solanderi*, the wahoo) on the American coasts, may be expected in Peru and are included in the key to the genera. The species, if taken, may be identified from the key, and no further mention will be made of them.

KEY TO THE GENERA

a. Dorsal fins far apart, distance between them longer than snout and eye; first dorsal composed of 8 to 10 spines.
  b. Maxillary entirely concealed by preorbital; scales covering entire body. **Pneumatophorus** (p. 362)
  bb. Maxillary not concealed by preorbital; scales present only on anterior part of body, forming a corselet---------------------------------- **Auxis**
aa. Dorsal fins near each other, the space between them not exceeding diameter of eye, sometimes contiguous; dorsal spines more numerous, rarely fewer than 13.
  c. Snout of moderate length, much shorter than rest of head, not beaklike; maxillary not concealed by preorbital; first dorsal with 14 to 22 spines.
    d. Scales present only on anterior part of body, forming a corselet.
      e. Teeth present on jaws only; gill rakers numerous, about 36 to 40 on lower limb of first arch---------------------**Katsuwonus** (p. 365)
      ee. Teeth in jaws and palatines, and sometimes on vomer; gill rakers fewer, about 25 to 27 on lower limb of first arch- **Euthynnus** (p. 367)
    dd. Scales covering entire body, sometimes enlarged in pectoral region and forming a corselet.
      f. First dorsal with 12 to 15 spines; pectoral short or long, equal to or longer than head in some species, with 32 to 35 rays- **Thunnus** (p. 368)
      ff. First dorsal with 16 to 22 spines; pectoral always shorter than head, with 19 to 24 rays.
        g. Body robust, its greatest thickness much in excess of half the depth; palatines with strong teeth; no teeth on vomer; scales enlarged in pectoral region, forming a more or less distinct corselet- **Sarda** (p. 372)
        gg. Body more compressed, its greatest thickness about half its depth; vomer and palatines with granular teeth; scales not enlarged in pectoral region---------------------- **Scomberomorus** (p. 375)
  cc. Snout equal to or longer than rest of head, beaklike; maxillary concealed by premaxillary; first dorsal with about 26 spines--------- **Acanthocybium**

Genus PNEUMATOPHORUS Jordan and Gilbert, 1883

Head pointed, depressed above; rather robust, not greatly compressed, tapering into a slender caudal peduncle; jaws with small sharp teeth in a single row; teeth also present on vomer and palatines; gill rakers long slender; scales very small, slightly, if at all, enlarged in region of pectoral fin; interval between dorsal fins exceeding length of snout and eye; first dorsal with 8 to 10 weak spines; second dorsal and anal each generally followed by 5 finlets; pectoral inserted near level of eye; air bladder present.

A single species comes within the scope of the present work.

PNEUMATOPHORUS PERUANUS Jordan and Hubbs

CABALLA

FIGURE 73

Scomber colias ABBOTT (not of Gmelin), 1899, p. 344, Callao, Peru.—STEINDACHNER, (not of Gmelin), 1902, p. 125, Callao, Peru.

Scomber japonicus STARKS (not of Houttuyn), 1906, p. 783, Callao, Peru.—EVERMANN and RADCLIFFE (not of Houttuyn), 1917, p. 54, pl. 5, fig. 1, Chimbote and Lobos de Tierra, Peru (synonymy; description).—NICHOLS and MURPHY (not of Houttuyn), 1922, p. 506, Chincha Islands and Pescadores Islands off Ancon, Peru.—TORTONESE (not of Houttuyn), 1939a, p. 55, Santa Elena Bay, Ecuador.

Pneumatophorus peruanus JORDAN and HUBBS, 1925, p. 211, Callao, Peru; Galápagos Islands (diagnosis, in key).

Scomber peruanus FOWLER, 1940b, p. 764, fig. 42, Peru.

Head 3.2 to 3.5; depth 4.0 to 5.4; D. VIII to X–I, 10 or 11–V; A. I–I, 10 or 11–V; P. 20 or 21; scales about 225; vertebrae 31 (two specimens dissected).

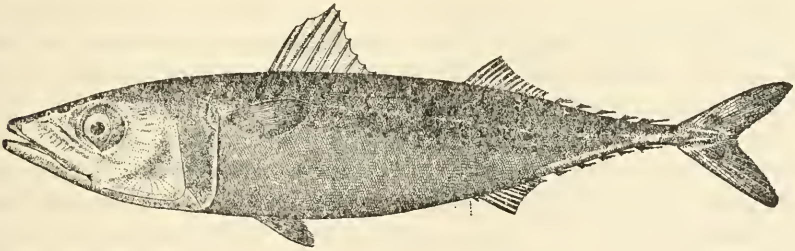

FIGURE 73.—*Pneumatophorus peruanus* Jordan and Hubbs. From a specimen 250 mm. long, Lobos de Tierra Island, Peru. (After Evermann and Radcliffe, 1917.)

Body quite robust, its greatest thickness among large specimens about three-fourths the depth, young more compressed; caudal peduncle very slender, 9.2 to 10.4 in head; head moderately compressed, somewhat flattened above; snout quite pointed, 3.4 to 3.7 in head; eye with much adipose tissue in large examples, 4.1 to 4.8 in head; mouth large, oblique; maxillary slipping entirely under preorbital, extending somewhat beyond anterior margin of eye, 2.5 to 2.65 in head; teeth pointed, in a single close-set series in each jaw, a single series of small teeth at each side on vomer, and 2 series of similar teeth on palatines; gill rakers slender, a little shorter than eye, 24 to 28 on lower and 11 to 13 on upper limb of first arch; lateral line more or less wavy; scales too small to enumerate accurately, slightly enlarged in pectoral region, about 19 to 24 rows between second dorsal and lateral line; first dorsal composed of slender spines, the third and fourth generally of nearly the same length, about equal to postorbital part of head, origin of fin about an eye's diameter behind base of upper ray of pectoral, its distance from tip of snout 2.6 to 2.75 in length; second dorsal small, with slightly concave margin, densely scaled in large specimens, its origin over or a little in advance of vent, followed by 5 finlets, the last one the longest; caudal with two low keels on base, its middle section densely scaled in large specimens; anal preceded by a short stiff detached spine, the rest of fin similar to second dorsal, also followed by 5 finlets; ventral moderate, inserted slightly in advance of origin of first dorsal, distance from its base to tip of mandible 2.6 to 2.8 in length, length of fin 2.3 to 2.9 in head; pectoral short, upper rays longest, 2.2 to 2.7 in head.

Color dark blue above; silvery below. Some specimens with distinct wavy bands on back, generally extending down the side to lateral line; the bands very indistinct in other specimens; and broken up into spots in still others. Most of the large specimens with dark spots on side below lateral line, these missing in all the smaller specimens, which also lack the bars. Ventral and anal fins pale; other fins more or less dusky; pectoral fin black at base, darkest on inner side.

The Mission secured 30 specimens, 110 to 355 mm. (92 to 295 mm. to base of caudal) long. The 5 smallest ones were seined; all the others were caught with hand lines. They are from Sechura Bay, Callao, Pachacamac Island, and Chilca Bay.

It is stated in the report of the Mission (1943, p. 268) that "lacaballa" "is taken in some quantity but is used exclusively for drying and salting since it is not highly regarded as a fish for fresh consumption. The mackerel, like the bonito, is an inshore species and is not taken in waters of the oceanic type. The great bulk of mackerel caught in Peru is taken with hand lines baited with small pieces of fish."

The Peruvian specimens are very close to Oriental ones, with which some authors have identified them. However, Jordan and Hubbs (1925, p. 211) have shown minor differences in the length of the head, snout, and upper jaw, in the distance from tip of snout to origin of first dorsal, and in the distance from tip of mandible and base of ventral. Most of the differences indicated by the authors named seem valid according to specimens examined. The following proportions, based on two specimens of *P. japonicus* (Houttuyn) from Japan, may be compared with those based on specimens from Peru used in the description: Head 3.75, 3.8; snout 3.2, 3.4; distance from snout to first dorsal 2.8, 2.9; distance from mandible to ventral 3.05, 3.1. *P. peruanus* differs from *P. diego* (Ayers), known from California and Oregon, according to Jordan and Hubbs (1925, p. 211) in the same characters as from *P. japonicus*.

Range.—Santa Elena Bay, Guayaquil, Ecuador, to the coasts of Peru and Chile; known also from the Galápagos Islands.

Genus KATSUWONUS Kishinouye, 1923

Body robust, naked outside the corselet; maxillary not concealed by preorbital; teeth present in jaws only; dorsal fins with only a short space between them, the anterior spines of the first fin very high, decreasing rapidly in length; second dorsal and anal each followed by 7 or 8 finlets; pectoral not very long, placed at or near level of eye, with about 26 or 27 rays.

A single widely distributed species is known.

KATSUWONUS PELAMIS (Linnaeus)

BARRILETE

Scomber pelamis LINNAEUS, 1758, p. 297, "Pelago inter Tropicos" (diagnosis).

Gymnosarda pelamis MEEK and HILDEBRAND, 1923, p. 310 (synonymy; description; range).

Katsuwonus pelamis KISHINOUYE, 1923, p. 453, figs. 5, 14, 19, 25, 52, and 57 (synonymy; description; habitat and fishery in Japan discussed; size attained).

Head 3.0 to 3.2; depth 3.8 to 4.1; D. XIV or XV–I, 13 or 14–VIII; A. II, 12 or 13–VII; P. 26 or 27; vertebrae 40 (one specimen dissected).

Body robust, its greatest thickness about two-thirds its depth, tapering strongly posteriorly; caudal peduncle slender, depressed, with a strong lateral keel, its depth 14 to 15.3 in head; head somewhat compressed, convex above; snout long, pointed, 3.3 to 3.7 in head; eye moderate, round, 5.7 to 6.1; interorbital 3.7 to 4.0; mouth slightly oblique, terminal; maxillary reaching nearly or quite opposite middle of eye, 2.6 to 2.8 in head; teeth in jaws in a single series, short and rather stocky; gill rakers long, slender, about four-fifths length of eye, 36 to 40 on lower and 15 or 16 (counted in only 3 specimens) on upper limb of first arch; lateral line missing anteriorly, curved downward at midlength, attaining a midlateral position under about the first dorsal finlet, straight from thence to caudal keel; scales present anteriorly in region of pectoral, extending on back to or beyond origin of first dorsal, reduced scales in lateral line, and a pointed area of scales extending about an eye's diameter beyond tip of pectoral fin; first dorsal composed of slender spines, the anterior ones long, posterior ones short, scarcely extending above dorsal groove, the first one 1.8 to 2.0 in head, origin of fin a little behind insertion of pectoral, its distance from tip of snout 2.6 to 2.9 in length; second dorsal somewhat elevated anteriorly, with deeply concave margin, the posterior rays being very short, its origin about equidistant from origin of first dorsal and base of next to last dorsal finlet; anal similar to second dorsal, its origin a little in advance of vertical from base of last ray of second dorsal; ventral somewhat shorter than pectoral, inserted slightly posterior to pectoral, its distance from tip of mandible 2.7 to 2.9 in length; pectoral moderately pointed, 1.9 to 2.1 in head.

Color very dark blue above, with metallic reflections; silvery below; lower part of head, chest, and area around ventral fins dirty white; lower half of side with two to four dark longitudinal stripes; spines of first dorsal dusky, anterior margin of first spine and membranes pale or white; second dorsal, dorsal and anal finlets, caudal, anal, and pectoral all more or less dusky; pectoral much darker on inner side than outside, the upper rays generally silvery; ventral fins white on outside, inner side dusky; inside of mouth largely dusky.

The Mission preserved 10 examples of the many that were caught. These specimens, which range in length from 485 to 595 mm. (425 to 525 mm. to base of caudal), form the basis for the description. The specimens were all taken by trolling, though it is stated in the report by the Mission (1943, p. 181) that this fish also was taken from the stern of the vessel with poles, "rigged with a short line and feather jig." The specimens preserved were caught at points 5 miles off Lobos de Afuera Island, 16 miles west of Hormigas de Afuera, 25 miles southwest of Punta Fraile, and 55 miles southwest of Ilo. This common species was observed and also caught elsewhere. The report (p. 235) stated further: "More skipjack were caught by the Mission than any other species." The largest individual listed in the report was 650 mm. long. The species was found principally in rather warm water, as 99.8 percent of all the fish caught were from water varying from 17° to 25.4° C. In another paragraph (p. 238) it is stated, "Skipjack are found in the transitional zones like the yellowfin (tuna) but they are more abundant than this species in the warm oceanic waters."

Although the skipjack (barrilete) was associated in a general way with the yellowfin tuna (atún) the report of the Mission (p. 239) said, "In contrast to the yellowfin tuna, a number of compact schools were seen. * * * They appeared at the surface more frequently." It is stated (p. 244) also that the food of the skipjack is about the same as that of the yellowfin tuna, which according to contents of stomachs examined aboard the vessel consisted of fish (especially anchovies) and squids. The skipjack (barrilete), according to the report (pp. 245, 246), is considered as of inferior quality, and consequently is of little commercial value in Peru.

Range.—Cosmopolitan, in temperate and tropical seas. I have found no previously published record of its occurrence on the coast of Peru.

Genus EUTHYNNUS Lütken, 1883

This genus differs from *Katsuwonus* in having teeth on the palatines and sometimes on the vomer, and with respect to internal structures described by Kishinouye (1923, p. 452). Vomerine teeth are absent in the species herein described, and the palatine teeth are scarcely discernible. The species may be distinguished from *Katsuwonus* by the fewer gill rakers, there being 25 to 27 on the lower limb of the first arch in *Euthynnus alletterata* and 36 to 40 in *Katsuwonus pelamis*.

Two species have been recognized from the Pacific coast of the Americas, the second species *E. lineatus* Kishinouye differing from the one herein described in having teeth on the vomer.

EUTHYNNUS ALLETTERATA (Rafinesque)

Scomber alletterata RAFINESQUE, 1810, p. 46, Palermo (original description).

Gymnosarda alletterata JORDAN and EVERMANN, 1896, p. 869, fig. 366 (description; range; synonymy).—MEEK and HILDEBRAND, 1923, p. 311 (synonymy; decription, based on specimens from the Atlantic coast of the United States, Hawaii, Java, and the Philippines; range).

Euthynnus alletterata KISHINOUYE, 1923, p. 457 (diagnosis in key).

Head 3.25, 3.3; depth 3.85, 3.85; D. XIV–11–VIII, XIV–11–VIII; A. II, 11–VII, II, 11–VII; P. 26, 27.

Body robust, its greatest thickness about two-thirds its depth, tapering strongly posteriorly; caudal peduncle very slender, depressed, with a moderately strong lateral keel, 13.7, 13.7 in head; head compressed, convex above; snout rather long, pointed 3.5, 3.6 in head; eye round, 6.2, 6.3; interorbital 3.4, 3.5; mouth large, oblique, terminal; maxillary reaching a little beyond middle of eye, broad, slipping partly under preorbital, 2.55, 2.65 in head; teeth in jaws in a single series, short and strong, none on vomer, scarcely discernible on palatines; gill rakers nearly as long as eye, 25, 27 on lower and 9, 9 on upper limb of first arch; lateral line wavy anteriorly, curved downward and becoming straight and midlateral in position under the second or third dorsal finlet; scales present anteriorly in region of pectoral, extending on back to second dorsal, reduced scales in lateral line, and a somewhat pointed area of scales extending to or beyond tip of pectoral fin; first dorsal with slender spines, the first ones long, the posterior ones short, scarcely extending above dorsal groove, the first one 1.85, 1.9 in head, origin of fin little behind base of upper rays of pectoral, its distance from tip of snout 3.0, 3.1 in length; second dorsal somewhat elevated anteriorly, with deeply concave margin, its origin about equidistant from origin of first dorsal and fifth or sixth finlet; anal origin under or somewhat in advance of vertical from first dorsal finlet; ventral considerably shorter than pectoral, inserted slightly posterior to pectoral, its distance from tip of mandible 2.6, 2.9 in length; pectoral moderately pointed 1.7, 1.75 in head.

Color very dark blue above; this color merging into silvery along middle of side; side of head, chest, and region around ventrals and base of pectoral a rather dirty white; one specimen (the larger one) with short black bars, running upward and backward above lateral line, and with obscure dark longitudinal streaks below lateral line, these broken up into large black spots anteriorly in space between pectoral and ventral fins. The dark markings missing in the other specimen at hand except for a few dark blotches between pectoral and ventral fins. Spines of first dorsal dark, the membranes white; ventral fin dirty white on outer surface, dusky on inner side; other fins all more or less dusky; mouth dusky within.

The Mission supplied two specimens, 555 and 605 mm. (490 and 548 mm. to base of caudal) long, both taken by trolling in the Gulf of Guayaquil near Cabo Blanco, though not on the same date, one having been caught on May 15 and the other one on August 15. The description is based on the two specimens from Peru, though I have had a few from other localities for comparison. While this species is regarded as cosmopolitan, no one apparently has compared and studied large series of specimens from different localities. It is possible, therefore, that differences may yet be found. The Peruvian specimens are plumper and have one less soft ray in the second dorsal and also in the anal than in two somewhat smaller specimens from Florida.

Although I follow Kishinouye (1923, pp. 452 and 457) in placing this species in a different genus from the related skipjack (barrilete), I am not sure that this can be done solely on the presence or absence of palatine teeth. In both species, according to Peruvian specimens, the palatine bones are bare, that is, there is a rift in the skin that covers the roof of the mouth. In one specimen of *E. alletterata,* in which the skin was cut away, I found some low protuberances on the bone, which seem to be missing in *Katsuwonus pelamis.* The most obvious distinguishing character, observable without dissection, is the great difference in the number of gill rakers. In *E. alletterata* the body, also, tapers more gently posteriorly, the pectoral fin is longer, and dark spots (variable in number) are present below the pectoral fin.

This species presumably is not numerous enough in Peruvian waters to be of commercial value, and no distinctive local name was supplied.

Range.—A pelagic species of world-wide distribution in temperate and tropical seas. No previous record of its occurrence in Peruvian waters has come to my attention.

Genus THUNNUS South, 1845 [23]

Body moderately robust; snout pointed, not very long; mouth rather large; maxillary not concealed by preorbital; teeth in jaws small, those on vomer and palatines in villiform patches; gill rakers long, moderately slender; scales covering entire body, enlarged, and forming a corselet in region of pectorals; interval between dorsal fins slight; first dorsal with 12 to 15 rather slender spines, the fin high anteriorly; second dorsal and anal each followed by 8 or 9 finlets; ventral fins rather small, less than half length of head; pectoral short or long, with about 32 to 35 rays.

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[23] This genus was divided into three genera by Kishinouye (1923, p. 433), namely, *Thunnus* South, *Neothunnus*, new genus, and *Parathunnus*, new genus. The divisions were based entirely on internal (anatomical) characters. I do not follow this new classification for the same reason that I declined to follow the splitting up of the family Scombridae as formerly understood (see footnote on p. 361).

A single species was taken on the coast of Peru. However, the common bluefin tuna, *T. thynnus* (Linnaeus), which is widely distributed and has been recorded from the Galápagos Islands, may be expected in Peru. Another tuna, often listed as *Germo alalunga* (Gmelin), if one considers the Atlantic and Pacific Ocean inhabitants identical, concerning which there still is considerable doubt, or as *G. germo* (Lacepède) if one considers the ones from the Pacific Ocean different from those from the Atlantic, almost certainly will be taken sooner or later in Peru, as it occurs both north and south of this country. A specimen from Chile (U.S.N.M. No. 22975) is before me. This is the common "albacore" of California, highly prized as a canned product. I provisionally use the name *germo*. The two species named, for which no descriptions are given herein, may be identified from the key that follows.

KEY TO THE SPECIES

a. Pectoral fin notably shorter than head, failing to reach origin of second dorsal, 4.8 to 5.6 in length; 26 or 27 gill rakers on lower limb of first arch; small specimens, at least, with pale spots and bars on lower part of side. (Data based on Atlantic specimens.) ---------------------- thynnus

aa. Pectoral fin about equal to or a little longer than head, reaching to or more usually beyond origin of dorsal, but not to origin of anal, 3.3 to 3.6 in length; 20 to 22 gill rakers on lower limb of first arch; small specimens, at least, with pale spots and bars on lower part of side. (Data based on Peruvian specimens.) ---------------------- macropterus (p. 369)

aaa. Pectoral fin very long, reaching to or beyond origin of anal, 2.3 to 3.0 in length; 21 or 22 gill rakers on lower limb of first arch; small specimens, at least, with pale longitudinal streaks along lower part of side. (Data based on a specimen from California and on one from Chile.) ---- germo

THUNNUS MACROPTERUS (Schlegel)

ATÚN; TUNO; ALBACORA

Thynnus macropterus SCHLEGEL, 1850, p. 98, pl. 51, Japan (original description).

Neothunnus macropterus KISHINOUYE, 1923, p. 446, figs. 13, 19, 23, 45, and 51 (synonymy; description; distribution; size attained; habits; food; properties of the flesh; spawning; relationship).—HERRE, 1936, p. 106, Galápagos Islands (synonymy; discussion; range).—WALFORD, 1937, p. 3, pl. 33 in color (compared with bluefin tuna; size; distribution; food; spawning; migrations; game qualities).

?*Germo argentivittatus* NICHOLS and MURPHY, 1922, p. 507, pl. 25, Peru (notes; identification based on a photograph).

Neothunnus albacora NICHOLS and LAMONTE (in part?), 1941, p. 30 (synonymy; discussion of synonymy, of development of dorsal and anal lobes, and of yellowfin tunas from the Atlantic and Pacific.)

Head 3.1 to 3.3; depth 3.4 to 3.7; D. XIV–13 to 15–VIII or IX; A. II, 11 to 13–VIII, rarely IX; P. 33 to 35.

Body moderately compressed, its greatest thickness often nearly three-fourths its depth, tapering strongly posterior to second dorsal; caudal peduncle strongly depressed, with a prominent lateral keel, and a minute keel above and below it on base of caudal, its depth 11.8 to 13 in head; head compressed, quite convex above; snout pointed, 3.0 to 3.4 in head; eye round, fairly large, 5.0 to 5.8; interorbital 2.8 to 3.4; mouth moderately large, terminal, oblique; maxillary with almost straight posterior margin, generally not quite reaching opposite middle of eye, 2.5 to 2.7 in head; teeth in jaws in a single series, rather small, pointed, curved inward; oval patches of villiform teeth on vomer and palatines; gill rakers nearly as long as eye, some of them often thickened at the end, their inner margins denticulate, 20 to 22 on lower and 7 to 9 on upper limb of first arch; lateral line wavy; scales on body minute, forming a more or less distinct corselet in region of pectorals; first dorsal high anteriorly, the first and second spines longest, about as long as snout and two-thirds the eye, decreasing rapidly in length behind third spine, origin of fin about over insertion of pectoral, its distance from tip of snout 2.9 to 3.1 in length; second dorsal elevated anteriorly, the lobe becoming very long in large specimens, 2.2 to 2.6 in head in the rather small specimens at hand; origin of anal about under end of dorsal; anterior lobe of anal generally scarcely as high as that of dorsal, 2.2 to 2.8 in head; ventral moderately small, 2.4 to 2.7 in head, its distance from tip of mandible 2.75 to 3.0 in length; pectoral large, reaching to or more usually beyond origin of second dorsal, nearly or quite as long as head, 3.3 to 3.6 in length.

Color very dark blue above, merging into the dirty gray or silver of lower parts of side; region around ventrals white; lower half or so of side with nearly vertical, sometimes curved pale silvery streaks, some of them broken into spots; dorsal, caudal, and pectoral fins more or less dusky, the pectoral quite dark on inner side; second dorsal and anal each with a black margin; finlets yellow, conspicuously margined with black; ventral largely white on outer side, dusky on inner side.

The proportions and enumerations used in the foregoing description are based on 12 specimens, 545 to 790 mm. (471 to 650 mm. to base of caudal) long, furnished by the Mission. These fish were caught with trolling lines, 25 miles southwest of Fraile Point; 9 miles west of Palominos Rocks, off Callao; and off Lomas Point. The report of the Mission (1943, p. 228) stated that tunas were caught during every month of the investigation (February to September 1941) from Cabo Blanco to Ilo, though not in water cooler than 17° C. They were caught near shore and also offshore; the presence of food and the temperature of the water apparently governed their movements.

Although the 610 fish measured by the Mission ranged in length from 490 to 1,200 mm., most of them were 650 to 770 mm. long.

The Mission (1943, p. 229) reported that the fish are taken commercially by trolling. The investigators were successful in catching the fish, also, from the stern of the vessel by using short stout poles, "rigged with a short line and a feather jig." This equipment is commonly used by tuna fishermen when schools of fish have been brought near with bait. Stomachs examined aboard the trawler contained chiefly anchovies, squids, small mackerel, and silversides (pejerreys).

The report of the Mission (1943, p. 23) has stated that this tuna is known as "albacora" in northern Peru and as "atún" and "tuno" in central and southern Peru. This difference in names in itself is confusing and the confusion is greatly increased by the use of "albacora" for the swordfish, *Xiphias gladius*, in central and southern Peru.

It seems that Jordan and Hubbs (1925, p. 219) believed the presence or absence of black on the finlets was significant. Schlegel's original plate (see reference above) does not show any black on the finlets, and Kishinouye's plate (see reference above) also fails to show it. However, all the specimens from Peru have the finlets prominently marked with black, as stated in the description. The black is indicated in Walford's plate (see reference above), though not prominently. In the number of gill rakers, fin rays, and finlets the Peruvian specimens agree with Japanese fish, as given for the latter by Kishinouye.

Nichols and LaMonte (see reference above) have stated that the Atlantic and Pacific yellowfin tunas are of the same species, and have united them under *Neothunnus albacora* (Lowe). It is not evident from the publication that these authors compared specimens, or accurate data based on specimens, from the two oceans, which in my opinion is necessary to prove their identity. Photographs have often been used by authors in classifying tunas. Consequently accurate enumerations of fin rays, gill rakers, and proportions are largely missing. Presumably because the relative length of the dorsal and anal lobes could be more or less definitely determined from photographs, this character has received considerable attention. However, Kishinouye (1923, p. 446), Herre (1936, p. 106), and Walford (1937, p. 3), all of whom examined many specimens of yellowfin tuna, agree that the character is virtually useless because of the great variation in development among individuals. As the lobes become elongated only when the fish attain a large size it is not usable, in any event, in identifying the smaller individuals. For reasons stated, I regard the classification of *T. macropterus* and its relatives unsettled. Although I am assigning the Peruvian material to *T. macropterus*, whose type locality is Japan, I do not regard it definitely settled that the yellowfin tunas of the Pacific coast of America and of Asia are identical.

Range.—"This albacore ranges over almost the whole Pacific north of the equator in the tropical and warm temperate regions. It is abundant from the Galapagos to the coast of California, about the Hawaiian Islands, and everywhere from the north coast of New Guinea, the Moluccas, Celebes, and Borneo, northward to the Bonin Islands and Japan. It is rare north of 35° N. Lat." (Herre, 1936, p. 107.)

Genus SARDA Cuvier, 1829

Body robust, somewhat compressed; head large; snout pointed; mouth large; maxillary not concealed under preorbital, reaching under or even beyond posterior margin of eye; teeth in jaws strong, somewhat compressed at base, similar teeth on palatines; none on vomer or tongue; gill rakers not very numerous, generally fewer than 20 on lower limb of first arch; scales present on body, somewhat enlarged in region of pectorals, forming a more or less distinct corselet; caudal peduncle with a prominent lateral keel, and a small one below and above it on base of caudal; first dorsal high anteriorly, its base longer than head, with about 18 to 22 spines; interval between dorsal fins very short; second dorsal and anal, elevated anteriorly, each followed by 6 to 9 finlets; pectoral small, much shorter than head.

Two species come within the scope of the present work.

KEY TO THE SPECIES

a. Gill rakers on lower limb of first arch 16 to 18; black stripes on upper part of side oblique (rarely nearly or quite horizontal)----- **chilensis** (p. 372)

aa. Gill rakers on lower limb of first arch 9; black stripes on sides horizontal-- **velox** (p. 374)

SARDA CHILENSIS (Cuvier and Valenciennes)

BONITO; CHAUCHILLA

Pelamys chilensis CUVIER and VALENCIENNES, 1831, p. 163, Valparaiso, Chile (original description).

Sarda chilensis ABBOTT, 1899, p. 345, Callao, Peru (relationship with *S. orientalis* and *S. sarda* discussed).—STARKS, 1906, p. 784, Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 55, Callao, Peru (description).—NICHOLS and MURPHY, 1922, p. 506, Callao, Peru.—MEEK and HILDEBRAND, 1923, p. 318, Panama Bay (synonymy; description; relationship with *S. sarda* discussed; range).

Head 3.25 to 3.4; depth 4.2 to 4.9; D. XVIII–13 to 15–VII or VIII; A. II, 10 to 13—VI or VII; P. 23 or 24; vertebrae 44 (one specimen dissected).

Body moderately robust, its greatest thickness about two-thirds its depth, tapering rather abruptly posteriorly; caudal peduncle depressed, with a prominent lateral keel and two smaller ones on base of fin, depth of peduncle 11 to 14 in head; head compressed, convex above; snout long, pointed, 2.9 to 3.1 in head; eye 6.4 to 7.5 in head; interorbital 3.3 to 3.9; mouth moderately large, slightly oblique, terminal; maxillary about half width of eye, scarcely reaching vertical from posterior margin of eye, 2.05 to 2.15 in head; teeth in jaws in a single series, compressed at base, curved inward, pointed, generally a pair of somewhat enlarged teeth on lower jaw anteriorly, palatines with a series of small teeth; gill rakers moderately slender, a little shorter than eye, 16 to 18 on lower and 6 to 8 on upper limb of first arch; lateral line wavy; scales minute, somewhat enlarged, though embedded, in region of pectoral, forming a more or less definite corselet; first dorsal composed of very slender spines, the anterior ones moderately elevated, the posterior ones extending little above dorsal groove, the second or third the longest, equal to or a little longer than snout, origin of fin a little in advance of pectoral, its distance from tip of snout 2.9 to 3.0 in length; second dorsal moderately elevated anteriorly, the last ray enlarged, origin of fin about equidistant from origin of first dorsal and sixth finlet; anal origin about under last ray of second dorsal; ventral moderately small, 3.0 to 3.5 in head; pectoral moderately pointed, reaching margin of corselet to rather more than an eye's diameter beyond it in some specimens, 1.85 to 2.2 in head.

Color dark blue above, generally with metallic reflections; the color of back gradually merging along middle of side, into the silvery gray of the lower parts; upper part of side with four to six more or less definite oblique black stripes running upward and backward, the stripes rarely nearly horizontal, not always uniform in position and slope on both sides of the same fish; fins more or less dusky; ventral and anal notably lighter than the other fins; ventral often white, at least at base, with an area of a similar color surrounding them.

The Mission supplied 13 specimens, 355 to 685 mm. (306 to 585 mm. to base of caudal) long, which are from the Gulf of Guayaquil, near Cabo Blanco; Lobos de Afuera Bay; Guañape Island; San Lorenzo Island; Pachacamac Island; and San Gallán Island.

Bonitos are reported by the Mission (1943, p. 248) as comprising the greater part of the catch of food fishes landed in Peru. As only one specimen of the second species, *S. velox*, was included among the specimens preserved, it seems probable that the commercial catch consists chiefly of *S. chilensis*. The fish, according to the report, are caught mostly in gill nets and with trolling lines. The largest catches were said to have been made between Talara and Ilo, and the fish were reported as most numerous from January to June. Large schools were observed at several different times and places, but always in inshore waters. The Mission measured 111 fish, which varied from 450 to 720 mm. in length, the average being 562 mm. The largest fish measured may be near the maximum size attained.

Three species of *Sarda* from the Pacific coast of America have been recognized by some authors. However, I fail to recognize more than two among the Peruvian specimens and did not find a third species among specimens from Panama and California that were compared. The extent of the corselet in comparison with the length of the pectoral, a character supposedly differentiating *S. chilensis* and *S. lineolata* (see Walford, 1936, p. 9; 1937, p. 22), is entirely unreliable. Among specimens examined from Peru and elsewhere the demarkation of the corselet sometimes is indistinct, and it may not be equally distinct or equally long on both sides of the same fish.

Range.—Puget Sound to Chile. (The range given is based on the belief, supported by the limited study reported above, that *S. lineolata* is not valid.)

SARDA VELOX Meek and Hildebrand

BONITO

Sarda chilensis GILBERT and STARKS (not of Cuvier and Valenciennes), 1904, p. 68, Panama Bay (diagnosis; abundance).

Sarda velox MEEK and HILDEBRAND, 1923, p. 320, pl. 24, Panama City (original description; compared with *S. chilensis*).—WALFORD, 1937, p. 23, pl. 38, fig. b (diagnosis; distribution).—SCHMITT and SCHULTZ, 1940, p. 3, Galápagos Islands.

Head 3.2; depth 4.25; D. XVIII–16–VIII; A. II, 12–VI; P. 24.

Body fairly elongate, robust, its greatest width about two-thirds its depth, tapering strongly posteriorly; caudal peduncle depressed, with a prominent lateral keel and two smaller ones on base of fin, depth of peduncle 11.8 in head; head compressed, convex above; snout long, pointed, 3.0 in head; eye 6.7; interorbital 3.9; mouth large, slightly oblique, terminal; maxillary fully half width of eye, reaching opposite posterior margin of eye, 1.95 in head; teeth in jaws in a single series, somewhat compressed at base, curved inward, pointed, a series of similar but smaller teeth on palatines; gill rakers stocky, somewhat more than half length of eye, nine on lower and only two developed on upper limb of first arch; lateral line wavy; scales minute, somewhat enlarged, though more or less embedded in region of pectoral, forming an indefinite corselet; first dorsal composed of slender spines, the anterior ones moderately elevated, the posterior ones extending little above dorsal groove, the second spine longest, about equal to length of snout, origin of fin a little in advance of pectoral, its distance from tip of snout 3.2 in length; second dorsal moderately elevated anteriorly, the last ray somewhat enlarged, origin of fin about equidistant from origin of first dorsal and seventh finlet; anal origin about under base of last ray of second dorsal; ventral rather small, 3.8 in head, its distance from tip of mandible 2.8 in length; pectoral pointed, reaching about half an eye's diameter beyond corselet, 2.35 in head.

Color dark blue, with metallic reflections, above; this color merging gradually into silvery along middle of side. Upper part of side with four longitudinal dark stripes; the second stripe (from above) is bent upward, and the next one below it is bent downward somewhat under the second dorsal, and between them are two short oblique bars, the second of these being forked. The fins are all more or less dusky, the anal and ventral being lighter than the other fins; ventral and pectoral notably darker on inner surface than on outer one.

A single specimen, 650 mm. (565 mm. to base of caudal) long, was furnished by the Mission. This specimen was taken by trolling in the Gulf of Guayaquil, near Cabo Blanco, and so far as known it is the only example taken on the coast of Peru. There are two specimens from the Galápagos Islands, 475 and 645 mm. (407 and 556 mm. to base of caudal) long, and two from the Pearl Islands, Panama, 540 and 555 mm. (460 and 475 mm. to base of caudal) long, at hand for comparison. The following proportions and enumerations are based on the Panama specimens, which in general agree closely with the Peruvian example: Head in length 3.3, 3.4; depth 4.4, 4.6; distance from snout to origin of dorsal 3.35, 3.5; distance from tip of mandible to base of ventral 2.8, 3.0. Eye in head 6.35, 6.4; snout 2.95, 3.0; maxillary 1.9, 1.9; interorbital 3.4, 3.7; caudal peduncle 11.7, 12.7; ventral 3.3, 3.35; pectoral 3.15, 3.5; D. XVIII–16–VIII, XVIII–16–VIII; A. II, 14–VI, II, 13–VI; P. 24, 24; gill rakers 2+8, 2+9.

This species differs prominently from *S. chilensis* in the fewer gill rakers and in color, as shown in the key and descriptions. It also differs in having a somewhat larger mouth, and usually it has one more ray in the second dorsal.

Range.—Magdalena Bay, Baja California (Walford, 1937, p. 23) to the Galápagos Islands and northern Peru. This species has also been recorded from Block Island, R. I., on the Atlantic (Breder, 1932, p. 31).

Genus SCOMBEROMORUS Lacepède, 1802

Body elongate, compressed; head moderately low, compressed; snout long, pointed; mouth large; maxillary not concealed by preorbital; teeth in jaws rather strong, compressed, with sharp cutting edges; vomer and palatines with granular teeth; gill rakers short, rather few; scales small, rudimentary, not forming a corselet; caudal peduncle with a keel in lateral line; first dorsal with about 14 to 18 slender flexible spines; interval between dorsal fins slight; second dorsal and anal each followed by 7 to 10 finlets; pectorals placed near level of eye; air bladder present.

A single species comes within the scope of the present work.

SCOMBEROMORUS MACULATUS (Mitchill)

SIERRA

Scomber maculatus MITCHILL, 1815, p. 426, New York (original description).
Scomberomorus sierra JORDAN and STARKS, *in* Jordan, 1895, p. 428, Mazatlán, Mexico (original description; compared with *S. maculatus*).—EVERMANN and RADCLIFFE, 1917, p. 55, Paita, Peru (description, based on one specimen).
Scomberomorus maculatus MEEK and HILDEBRAND, 1923, p. 324, Panama, both coasts (synonymy; description; specimens from opposite coasts compared; range).

Head 3.9 to 4.9; depth 4.4 to 5.8; D. XVI to XVIII–15 to 18–VIII or IX; A. II, 15 to 17–VIII or IX; P. 19 or 20; vertebrae 47 (two specimens dissected).

Body considerably compressed, its greatest thickness among large specimens about half the depth; dorsal and ventral outlines about evenly convex; head compressed; snout quite pointed, 2.4 to 3.0 in head; eye 4.7 to 7.5; interorbital convex, 3.1 to 4.6; mouth moderately oblique; maxillary broad, round posteriorly, not quite reaching posterior margin of eye in specimens about 120 mm. long, to or beyond this point in large adults, 1.65 to 1.9 in head; teeth in jaws compressed at base, pointed distally, variable in size and number, one large specimen with 13 on one side of upper jaw, another with 29; gill rakers virtually undeveloped in the small specimens at hand, about three-fourths length of eye in the large ones, 11 or 12 on lower and 3 more on upper limb of first arch; lateral line more strongly waved in some specimens than in others, with a prominent keel on caudal peduncle in large specimens, keel scarcely evident in small individuals; first dorsal with slender spines, highest anteriorly, its base longer than head, its origin rather less than diameter of eye behind base of pectoral, its distance from tip of snout 3.5 to 4.1 in length; second dorsal elevated anteriorly, with deeply concave margin in large adults, its origin somewhat in advance of that of anal, densely covered with scales in large specimens; anal similar to second dorsal; ventral small, inserted under base of lowermost rays of pectoral, distance from its base to tip of mandible 3.4 to 4.0 in length; pectoral rather short, with an evident lower lobe, without scales, 1.5 to 1.8 in head in large specimens, proportionately shorter in the small ones, 2.1 to 2.3 in head.

Color of the large specimens in the collection (varying in length to base of caudal from 462 to 606 mm.) dark brown above; this color shading into silvery gray along middle of side; silvery below; sides with brown spots (bronze in life) generally arranged in irregular longitudinal rows, the number varying from two rows, with a few spots anteriorly representing a third row, to four indefinite rows; spinous dorsal black, exclusive of its base posterior to the fifth or to the sixth or seventh spine, which is translucent and occasionally white; ventral fins pale; the rest of the fins all more or less dusky; pectoral darkest on inner side and along upper and distal margins. The smaller specimens, ranging in length from 100 to 243 mm. to base of caudal, agree in ground color with the large ones, but they lack the spots on the sides; and the fins, exclusive of the spinous dorsal, are paler.

The Mission preserved 4 large specimens, 550 to 720 mm. (462 to 606 mm. to base of caudal) long, and 10 smaller ones, 120 to 295 mm. (100 to 243 mm. to base of caudal) long. The large ones were all taken on trolling lines in the Gulf of Guayaquil, in part off Zorritos and in part near Cabo Blanco. The smaller ones, at least mostly were seined, in part at San Lorenzo Island, and in part in Chilca Bay. The foregoing description is based entirely on Peruvian specimens.

The report of the Mission (1943, p. 273) has stated that the "sierra" is to be regarded as an inhabitant of the inshore water, and that the usual distribution ranges northward from Aguja Point. However, in 1941, when the water was abnormally warm, sierras were taken farther south. It is reported that commercial fishermen took many in March, April, and May of that year at Callao, and the Mission took an example at Cerro Azul in March. The report, furthermore, stated, "Sierra is one of the best Peruvian fishes and it is highly esteemed as a food fish."

Attempts have been made to distinguish between the Spanish mackerals (sierras) of the Atlantic and Pacific coasts of America. The Pacific coast one indeed was given a specific name, *S. sierra* (see reference above). I have examined a considerable number of specimens during the past 33 years or so and have made direct comparisons of specimens from the opposite coast and rather extensive measurement and enumeration of fin rays, gill rakers, and teeth. These data have been summarized, and although it does not seem appropriate to include them here it may be stated that they indicate at most different races for the opposite coasts. Briefly, the average number of spines in the first dorsal averages slightly lower in the Pacific coast fish, the rays in the second dorsal and anal a little higher, the eye a little smaller, and the snout and maxillary a little shorter. The teeth vary so greatly in size and number among individuals, even from one locality, that they are useless for diagnosis. The spots on sides not only vary in number among individuals of equal size, but also with age, and consequently they are not diagnostic, though they seem to be rather more numerous in the Pacific coast specimens. The differences are not regarded as of specific value.

Range.—On the Atlantic from Maine to Brazil, and on the Pacific from southern California to the Galápagos Islands and northern Peru.

Family ISTIOPHORIDAE: Sailfishes and Spearfishes

Body elongate, deepest in region of shoulders, tapering gradually posteriorly; caudal peduncle, with two rather low keels on side; upper jaw produced, though shorter, narrower, and with rounder edges than in the swordfish; teeth in jaws small, persistent; gills, four; scales present, long, narrow, more or less embedded; two dorsal fins, the first very long, generally occupying fully two-thirds of length of back, second dorsal small; two anal fins, the second smaller than the first, about opposite second dorsal; ventral fins present, thoracic, with one to three rays; pectorals generally rather long, and narrow.

Two genera no doubt occur from time to time on the coast of Peru. In the report of the Mission (1943, p. 248) the swordfish and the marlin ("*Makaira* sp.") are discussed together. The marlin was seen, but efforts to catch examples failed. No record of specific identifications of marlins taken on the coast of Peru has come to my attention. In any event, the species are not well known. Therefore, no specific name or names can be supplied. The Mission has not reported sailfish. However, Walford (1937, p. 49) gave the usual range of the Pacific sailfish, *Istiophorus greyi* Jordan and Evermann, as extending from "Cape San Lucas to Peru." A key to the two genera that seemingly occur on the coast of Peru is offered, but no descriptions of the species are included. If examples are taken, the species probably can be identified from the work by Jordan and Evermann (1926), or from the book by Walford (1937).

KEY TO THE GENERA

a. First dorsal very large, forming a "sail"-------------------- **Istiophorus**

aa. First dorsal elevated anteriorly only, the rest of fin low, not forming a "sail"-- **Makaira**

Family XIPHIIDAE: Swordfishes

Body elongate, robust; caudal peduncle slender, with a strong lateral keel; upper jaw greatly produced, forming a "sword"; teeth wanting in adults, though present in young; gills four; scales wanting; two dorsal fins in adults, single, high, and continuous in young, the first beginning over gill opening, the second situated far back, very small; caudal fin broadly forked; two anal fins in adults, single and continuous in young, the first rather large, the second small and opposite the second dorsal; ventrals wanting; pectorals long, narrow, pointed.

A single genus and species is known.

Genus XIPHIAS Linnaeus, 1758

SWORDFISHES

The characters of the genus are those of the family.

XIPHIAS GLADIUS Linnaeus

ALBACORA

Xiphias gladius LINNAEUS, 1758, p. 248, "Oceano Europae" (original diagnosis).—JORDAN and EVERMANN, 1926, p. 71, pl. 20 (distribution; size attained; synonymy).—WALFORD, 1937, p. 33, pl. 40 in color (diagnostic characters; size attained; distribution; seasonal abundance; food; habits; parasites; spawning; enemies; aggressiveness; food and medicinal value; angling notes).—GUDGER, 1940, pp. 215–315, figs. 1–22, pls. 3–9 (behavior; structure; bibliography).

Head with snout about 2.0 in length to base of caudal; depth about 5.5 to 6.5; D. about 39 or 40–4; A. about 18–4.

Color dusky, varying from metallic purplish, lead color, to almost black.

The swordfish is readily recognized by the greatly produced, flat, sharp-edged snout or "sword"; the absence of ventral fins; absence of scales; absence of teeth; well separated dorsal fins (in adults), and the single strong lateral keel on caudal peduncle. The young differ greatly from the adults, having rudimentary scales; single or continuous dorsal, and anal fins; both jaws produced; and teeth present.

No specimens were secured by the Mission. It is stated in the report (1943, p. 248), however, that "a number" of swordfish was seen but that efforts made to catch examples failed. It is stated, furthermore, that anglers in increasingly larger numbers are going to Peru to fish for this species and the marlin. The fish are reported as occurring chiefly on the edge of those areas where "hot" and cold water merge. The fish is said to enter the commercial fishery only "to a limited extent at Mollendo and Ilo, and although not reported in the statistics for Talara and Cabo Blanco, they are known to be taken at these places also." The largest catches were made in April and September.

The swordfish feeds on schools of fishes, probably without much choice. Among the fishes eaten, anchovies, sardines, herring, mackerel, barracuda, and flyingfishes have been named. It is reported to feed extensively on squids also.

The swordfish is pelagic and ranges far and wide. Its spawning habits remain virtually unknown. Small examples are rarely taken. A very large size is attained. There is a record of one taken off New England that weighed 915 pounds dressed, estimated total weight 1,000 pounds. This fish was 15 feet long. Many accounts of the pugnacity of swordfish have been published. That it sometimes rams dories is an established fact, but that it does it deliberately and for a definite purpose has not been fully proved. E. W. Gudger (1940) has brought together in one paper all the evidence, partly published and some not previously published, concerning the pugnacity of the swordfish. The reader is referred to this paper for full particulars.

Range.—Both sides of the Atlantic, northward to Norway and Newfoundland Banks and Cape Breton, and about to latitude 35° south. On the Pacific coast of America from southern California to Chile. Also recorded from the Mediterranean and Red Seas, Cape of Good Hope, Indian Ocean, etc.

Family GOBIIDAE: Gobies

Body oblong or elongate, compressed at least posteriorly; head often more or less depressed; opercle and preopercle unarmed; premaxillaries protractile; skin of head continuous with covering of eyes; gill openings largely restricted to the sides, the membranes being united with the isthmus; gills four, a slit behind the fourth; teeth in one or a few series, or in a band in each jaw, generally small; lateral line wanting; scales present or absent; dorsal fins two, separated or connected, the spinous part with about two to eight flexible spines; caudal separate from dorsal and anal; anal generally similar to soft dorsal, with a single weak spine; ventrals united, forming a sucking disk, free from abdomen.

A single genus of this large family is known from Peru.

Genus BATHYGOBIUS Bleeker, 1878

Body moderately robust; head broad, depressed; snout bluntly rounded; eyes fairly large, close together; mouth moderate, somewhat oblique; teeth in a band in each jaw, no strong canines; scales moderately large, ctenoid, wanting on snout and side of head; dorsal fins separate, the first with six or seven spines; caudal round; pectoral large, with free, silklike rays above.

A single species has been recognized from Peru.

BATHYGOBIUS SOPORATOR (Cuvier and Valenciennes)

PEJE-GATO

Gobius soporator CUVIER and VALENCIENNES, 1837, p. 56, Martinique (original description).—REGAN, 1913, p. 279, Lobos de Tierra, Peru.

Mapo soporator STARKS, 1906, p. 799, Paita, Peru, and Guayaquil, Ecuador.—EVERMANN and RADCLIFFE, 1917, p. 134, Lobos de Afuera, Peru (synonymy; description).

Bathygobius soporator MEEK and HILDEBRAND, 1928, p. 867, both coasts of Panama (synonymy; description; range).

Head 3.4; depth 5.1; D. VI, I, 9; A. I, 8; scales 40.

Body fairly robust, compressed posteriorly; head broader than deep; caudal peduncle long, 3.0 in head; snout blunt, 3.4; eye directed very slightly upward, 5.2; interorbital 9.6; lips fringed; mouth moderate, oblique, terminal; gape reaching below anterior margin of pupil; teeth in a band in each jaw, pointed, those of outer series and also those of inner series somewhat enlarged; anterior nostril in a short tube; numerous pores and papillae about the head, the most prominent papillae consisting of a series across chin, and a row extending from lower lip to posterior margin of preopercle; scales ctenoid, extending slightly on base of caudal, and forward nearly to interorbital; dorsal fins well separated, the fourth spine longest, 1.9 in head; second dorsal notably longer and higher than the first; caudal round, a little shorter than head; anal short, the last ray longest, origin of fin slightly behind that of second dorsal, its base 1.4 in head; ventral disk large, its longest rays 1.4 in head; pectoral large, reaching well beyond ventral disk but not quite to origin of anal, 1.2 in head.

Color dark brown above, paler underneath; back and sides with dark cross bars, these most distinct laterally; head nearly uniform dark brown above, with a small black spot behind eye; vertical fins dusky; ventral disk and pectoral light, the latter with indefinite dark cross lines.

A specimen, 117 mm. (92 mm. to base of caudal) long, secured at La Lagunilla by the Mission, forms the basis for the foregoing description. The four specimens collected at Lobos de Afuera by R. E. Coker, and described by Evermann and Radcliffe (see reference above), were not seen by me. This species evidentally is not abundant on the coast of Peru.

Range.—"Known from all warm seas" (Meek and Hildebrand, 1928, p. 868).

Family GOBIOIDIDAE

Body greatly elongate, compressed; head rather low and long; eye small or rudimentary; mouth large, oblique; lower jaw projecting; no barbels; teeth in jaws in one or two series; gills 3½; scales present at least on posterior part of body; dorsal fin single, continuous, anteriorly with flexible spines; caudal joined to the dorsal and anal; ventral fins united, forming a disk.

A single genus is known from Peru.

Genus GOBIOIDES Lacepède, 1800

Teeth in the jaws in two series, those of the outer series enlarged; scales covering body, more or less embedded, becoming smaller forward; dorsal with about 6 to 8 spines, and 14 to 16 soft rays; anal with 1 spine, and about 14 to 16 soft rays; caudal long, pointed. Other characters are included in the description of the family.

One species is known from Peru.

GOBIOIDES PERUANUS (Steindachner)

Amblyopus broussonetii GÜNTHER, 1861, p. 136 (not of Lacepède), Guayaquil, Ecuador (diagnosis; range given as "Coasts of Peru and Guayaquil," though no specimen was definitely listed from Peru).

Amblyopus (*Gobioides*) *peruanus* STEINDACHNER, 1880, p. 94, pl. 2, figs. 2, 2a, Guayaquil, Ecuador (references; description; compared with *A. broussonetii*).

Gobioides peruanus EVERMANN and RADCLIFFE, 1917, p. 134, Bay of Paita, Peru (synonymy; description; apparently the first definite Peruvian record).

Head 4.5, 5.0; depth (just in front of ventral) 6.75; 8.6; D. VIII, 14, VIII, 15; A. I, 15; I, 14; P. 19, 18.

Body very elongate, tapering posteriorly, compressed; head compressed, rather flat above; snout broad, 4.1, 4.5 in head; eye very small, a mere dot; interorbital (space) broad, 5.8, 4.0 in head; mouth moderately large, strongly oblique, the tip of lower jaw being fully as high as eye; maxillary reaching under eye, 2.6, 2.4 in head; teeth in each jaw in two series, those of outer series movable, widely spaced, compressed, much the largest, and those of lower jaw notably larger than the ones in upper jaw; gill membranes attached to isthmus; lateral line not evident; scales becoming smaller, farther apart, and more deeply embedded forward, not extending on head; dorsal continuous, no notch between spinous and soft part, distance from its origin to tip of snout 3.1, 3.4, in length; caudal attached to dorsal and anal, long and pointed, apparently increasing proportionately with age, 4.4, 2.9 in length; anal beginning at vertical from first articulated ray of dorsal; ventral disk on a thick base below base of pectoral, 1.6, 1.33 in head; pectoral broad, reaching tip of ventral disk in the smaller specimen, but falling short of this point in the larger one, 1.4, 1.5 in head.

Color grayish; upper surface of head and back with brownish dots.

The description is based on two small specimens. One 38 mm. (31 mm. to base of caudal) long, dredged in Sechura Bay by the Mission, and the other, 81 mm. (60 mm. to base of caudal) long, was secured in Paita Bay by R. E. Coker. These specimens in general agree fairly well with Steindachner's description, which was based on larger material, specimens 90 to 420 mm. long being mentioned. The minor differences in proportions, and the more prominent differences in color (for Steindachner's specimens had violet and brownish cross bands) may be ascribed to the differences in size and age.

The small specimens from Peru were compared with two (*G. broussonetii*) from Pará, Brazil, which unfortunately are too large for satisfactory comparison, the latter being 125 and 130 mm. long to base of caudal. The mouth obviously is more oblique in the Peruvian examples, the tip of the lower jaw being on the same level as the eye, whereas it is well below the eye in the Brazilian specimens. Furthermore, the maxillary reaches under the eye in Peruvian examples and beyond the posterior margin of eye in the Brazilian ones. Also, the teeth of the outer series in the lower jaw are notably larger than in the upper one in the Peruvian specimens, whereas those of the upper jaw are larger in the Brazilian ones. It was noticed, also, that even though the Peruvian examples are smaller, the interorbital space is broader and flatter, being contained 4.0 and 5.8 times in the head and 10 times in the Brazilian specimens. Some of these differences already were pointed out in the original description. There can be no doubt, then, that the specimens from the opposite coasts represent different species.

Range.—Coasts of Ecuador and northern Peru. Recorded, also, from the Pedregal River, Honduras, by Clark (1936, p. 391).

Family BLENNIIDAE: Blennies

Body elongate; premaxillaries not protractile; teeth in jaws in a single principal close-set series, with or without canines; scales wanting; spinous and soft parts of dorsal usually of about equal length; caudal free, with about 13 principal rays; anal long, with 1 or 2 feeble spines; ventral fins jugular, each with a small spine, and 2 to 4 simple rays; pectoral large, with broad base.

KEY TO THE GENERA

a. Gill membranes free and continuous across isthmus, openings not restricted to sides.
  b. Each jaw anteriorly with 2 to 4 hooked canines; caudal fin with concave margin ---------------------------------- **Ophioblennius** (p. 383)
  bb. Jaws not provided with anterior canines, lower jaw usually (if not always) with a canine posteriorly, at or near angle of mouth; caudal fin in adults generally with convex margin ---------------- **Scartichthys** (p. 386)
aa. Gill membranes broadly united to isthmus, restricting openings to sides; no canines ---------------------------------- **Hypsoblennius** (p. 390)

Genus OPHIOBLENNIUS Gill, 1860

Body elongate, compressed; head short, anteriorly moderately decurved; mouth moderate, more or less terminal, or the lower jaw included; lower jaw anteriorly with 4 hooked canines, and sometimes with a few small lateral canines; upper jaw anteriorly with 2 or 4 hooked canines; minute, pointed, movable teeth on margins of jaws also present; gill openings wide, not restricted to the sides, the membranes continuous and free from the isthmus; lateral line incomplete; scales missing; dorsal fin deeply notched, composed of about 10 to 14 spines, and 12 to 23 soft rays; anal with 2 feeble spines and about 14 to 25 soft rays; caudal usually free from dorsal and anal, its margin concave.

Two species appear to come within the scope of the present work.

KEY TO THE SPECIES

a. Anal with 20 to 21 (II, 18 or 19) rays; D. XII, 17, occasionally XII, 16; only the 2 middle canines in upper jaw smaller than those in lower jaw; lower jaw usually with 2 canines, occasionally with 1 or 3. **mazorkae**, new species (p. 384)
aa. Anal with 17 (II, 15) rays; D. XII, 16; canines in upper jaw smaller than those in lower jaw; lateral canines in lower jaw probably missing ---------------------------------- **xiphiodon** (p. 386)

OPHIOBLENNIUS MAZORKAE, new species

FIGURE 74

Head 3.6 to 4.3; depth 4.2 to 4.5; D. XII, 17, occasionally 16; A. II, 18 or 19, occasionally 17; P. 14; vertebrae 33 (three specimens dissected).

Body compressed, its greatest thickness about two-thirds the depth; head compressed, its dorsal outline convex; caudal peduncle rather long, compressed, 3.0 to 3.6 in head; snout only moderately blunt, 4.0 to 5.0; eye rather large, 3.1 to 3.6; interorbital narrow, 8.0 to 11; mouth moderate, nearly horizontal; lower jaw included; maxillary generally reaching to or a little beyond anterior margin of pupil, 2.8 to 3.9 in head; teeth in each jaw in an outer series, minute (not visible without magnification), pointed; each jaw anteriorly with 4 hooked canines (shaped much like barbless fish hooks), those of lower jaw all of about equal size, two outer ones in upper jaw of same size as those of lower jaw, the two middle ones smaller; those of upper jaw and the two inner ones of lower jaw bent inward, the two outer ones in lower jaw bent outward and backward; lower jaw laterally usually with two sometimes one or three, small hooked canines; vomer with a bony ridge, but without teeth; upper lip minutely fringed; a short broad tentacle distally slightly fringed, behind anterior nostril; a longer one, about as long as pupil, with fringed edges, on upper margin of eye, slightly posterior to midlength; nape generally at least with two minute tentacles, well removed from midline; gill rakers virtually undeveloped, mere points; lateral line curved, extending only about to vertical from beginning of soft dorsal, the pores somewhat elevated; dorsal fin beginning a little in advance of margin of opercle, very deeply notched, the two parts almost separate, the spines very slender, flexible, the anterior one generally highest, about 1.5 to 2.0 in head, the last spine small, not longer than pupil; soft part of dorsal slightly longer than spinous part, its longest rays of about same length as the longest spines; caudal fin concave, a little shorter than head; anal long, of about same height as soft dorsal, its first spine very small, its base 2.3 to 2.5 in length; ventral with two externally visible filaments (which upon removal of the skin may be separated into a spine and five articulated rays), 1.3 to 1.6 in head; pectoral usually reaching to or a little beyond origin of anal, rounded, the longest rays below middle of fin, about as long as head, 4.0 to 4.4 in length.

Color pale yellowish; middle of back with about 9 to 11 more or less quadrate brownish blotches, usually broader than the interspaces, the blotches as seen under magnification being composed largely of more or less disconnected spots, mostly having a black point as a center; upper parts of head largely dusky brown; region surrounding mouth dusky; gill covers partly dusky, with large dark chromataphores on inside; anterior spine of dorsal, and distal third of spinous part of dorsal black, the color more or less broken up into coarse punctulations; soft part of dorsal pale; caudal pale, with a narrow dark cross bar at base; anal pale, with a more or less continuous dark streak at base; ventral pale; pectoral pale at base, the distal third or so black, this color sometimes broken up into coarse punctulations.

Several dozen specimens, 35 to 42 mm. (28 to 35 mm. to base of caudal) long, were taken by the Mission, under a light, at Mazorka Island, Huaura Group. The proportions used in the description are based on 9 and the enumerations of fin rays on 20 specimens. The specimen selected as the type (U.S.N.M. No. 128188) is 40 mm. (32 mm. to base of caudal) long. The following proportions and enumerations apply to the type: Head 3.8 in length; depth 4.0; anal base 2.4; pectoral 4.0. Eye 3.6 in head; snout 3.6; interorbital 10.5; maxillary 3.2; caudal peduncle 3.6; first dorsal spine 1.5; ventral 1.4. D. XII, 17; A. II, 18; P. 14.

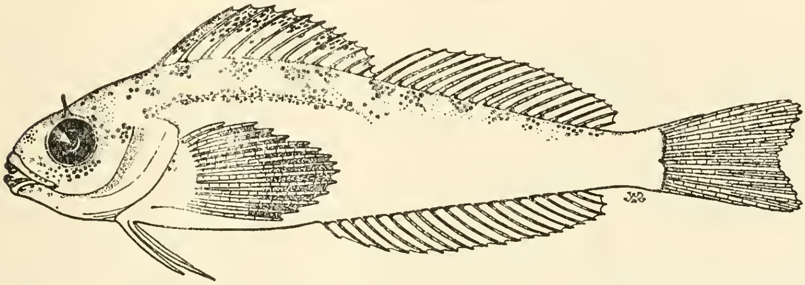

FIGURE 74.—*Ophioblennius mazorkae*, new species. From the type, 40 mm. long, Mazorka Island, Peru (U.S.N.M. No. 128188).

The examples herein described appear to be close to *O. xiphiodon* Clark, of which no examples are available for comparison. According to the description, *xiphiodon* has fewer anal rays; given as "17" in the original description, and as "II, 15" by Reid (1943, p. 374), who had a paratype. It is stated also that the 4 canines in the anterior part of upper jaw are smaller than those in the lower jaw, whereas only the 2 middle ones are smaller in the specimens at hand. Furthermore, lateral canines in the lower jaw are not mentioned in the description of *xiphiodon*. The number of vertebrae is given as "about 10+20=30" for *xiphiodon*, whereas in 3 specimens examined from among those before me the total number is constantly 33. The description of the color of *xiphiodon*, as far as it goes, agrees fairly well with the specimens at hand. However, it is stated, "pectoral black, tipped with coarse punctulations." Only the distal third or so of this fin in the specimens at hand is black, the black color correctly consisting of coarse punctulations. One might suspect that a hyphen was inadvertently replaced by a comma, and that at first the description was written "pectorals black-tipped with coarse punctulations," if Reid (1943, p. 378), who presumably had a paratype before him, had not repeated the description in his key without modification. Finally, no mention is made of a black line or streak along the base of the anal, which is conspicuous in the specimens now at hand.

Range.—Known only from the type material from Mazorka Island, Huaura Group, Peru.

OPHIOBLENNIUS XIPHIODON Clark

Ophioblennius xiphiodon Clark, 1938, p. 183, Callao and "Chinchas," Peru, and Valparaiso, Chile (original description; compared with *O. pinchoti* Fowler; holotype from Callao).—Reid, 1943, pp. 374 (key), 380 (reference; notes).

No specimens are at hand. The following proportions and enumerations, based on the type, a specimen 44 mm. long, were copied from the original description: Head in length 3.6; depth 4.5. Eye in head 3.3, snout 4.0; interorbital 5.0; maxillary 3.3. D. XII, 16; A. 17; branchiostegals 6; vertebrae (not based on type) "about 10+20=30." The teeth were described as follows: "A row of minute teeth attached loosely in bunches back of the lips and freely movable; four strong, curved canines near symphysis of lower jaw, and four smaller ones in upper jaw." The description of the color states: "Top of head dusky, spinous dorsal punctulate, a series of square, minutely punctulate blotches, about 10 in number and somewhat wider than the interspaces, each side of middorsal line; a very narrow bar of minute dots across base of caudal; anal, soft parts of dorsal, and ventral plain; pectoral black, tipped with coarse punctulations. All the specimens have the same general color pattern, but some are paler, some darker, and some have additional small, dusky blotches along the middle of the side."

The relationship of this species and *O. mazorkae* cannot be definitely determined, though the two probably are closely related, as indicated in the descriptions and more particularly by the comparisons made in the account of *O. mazorkae.*

Range.—Known only from the type material from Callao and "Chinchas" (presumably Chincha Islands, Peru, and from Valparaiso, Chile.

Genus SCARTICHTHYS Jordan and Evermann, 1898

Body elongate, compressed; head short, anteriorly steep, straight to more or less rounded; eyes lateral, placed high; interorbital narrow; gill membranes free and continuous across isthmus; branchiostegals 6; mouth horizontal; upper jaw semicircular in outline; lower jaw included; lips free, covering the teeth; teeth implanted in the gums, movable, in a principal close-set series, with shorter, largely hidden, widely spaced teeth on outside, present in at least some species; a posterior canine in lower jaw usually (if not always) present;

cirri at nape well separated at median line; dorsal fin notched, with about 12 spines and 17 to 22 soft rays; anal with 2 spines and about 17 to 23 soft rays, the spines in adult males bearing fleshy bulbs; ventral with 4 rays.

Two species are recognized herein, one of which had not previously been reported from Peru.

KEY TO THE SPECIES

a. Pectoral fin about as long as head, 3.8 to 4.5 in length; color uniform grayish brown (adults), or light brown with a series of dark blotches on back and another along middle of side (young)---------------------gigas (p. 387)

aa. Pectoral fin shorter than head, 5.4 in length; color pale olivaceous (probably yellowish in life), back with a continuous dark band, and another dark band along middle of side-----------------------------eques (p. 389)

SCARTICHTHYS GIGAS (Steindachner)

BORRACHO; SUEÑO

Salarias gigas STEINDACHNER, 1876, p. 172, Callao, Peru (original description).

?*Salarias rubropunctatus* JORDAN and GILBERT (probably not of Cuvier and Valenciennes), 1883b, p. 628, Pearl Islands, Panama and Callao, Peru (notes).[24]—NICHOLS and MURPHY, 1922, p. 513, North Chincha Island, Peru.

Alticus gigas EVERMANN and RADCLIFFE (in part), 1917, p. 146, Lobos de Afuera, Chincha Islands, Ballestas Island, and Independencia Bay, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 513, South Chincha Island, Peru (explanation of the application "borracho").

Head 3.4 to 4.3; depth 3.3 to 4.1; D. XII, 17 (occasionally 16 or 18); A. II, 17 to 19; P. 14; vertebrae 32 or 33 (two specimens dissected).

Body compressed, its greatest thickness about two-thirds its depth; head compressed, nearly as deep as long, its dorsal outline steep in advance of eyes (especially in small specimens), gently convex from eyes to origin of dorsal; caudal peduncle short, much compressed, 2.6 to 3.6 in head; snout very blunt, 2.3 to 3.0; eye placed high, 3.8 to 6.1; interorbital flat or slightly concave, 7.9 to 16; mouth rather small, horizontal, slightly inferior, the lower jaw being included; maxillary generally reaching under middle of eye, 2.7 to 3.3 in head; teeth in jaws in a close-set series, with an outer row of teeth set far apart, only about half as long as the teeth in the main row, and largely covered by the gums; the teeth all somewhat movable; a fixed canine posteriorly in lower jaw, occasionally missing on one or both sides, probably broken, also easily overlooked in small examples; no teeth on vomer or palatine, though provided with a bony edge; upper lip fringed; a tuft of tentacles about as long as pupil behind anterior nostril; a flat, fringed tentacle on upper posterior margin of eye, only about as long as eye in small examples, greatly exceeding length of eye in large ones, apparently no longer in males than in females; 2 small simple transversely placed tentacles, well removed from median line in young, becoming longer and fringed with age; gill rakers scarcely half length of eye, about 17 or 18 on first arch; lateral line curved anteriorly, reaching middle of side and becoming straight over anterior part of anal, the straight part equal to or a little longer than chord of curved part; dorsal fin beginning somewhat behind margin of preopercle, deeply notched between spinous and soft parts, the spines very slender and flexible, the middle ones longest, about 1.3 to 2.2 in head; soft part of dorsal about equal in length to spinous part, but slightly higher; caudal fin usually broadly convex, though occasionally nearly straight, and rarely slightly concave, generally a little shorter than head, 3.8 to 4.7 in length; anal long, beginning a little in advance of soft part of dorsal, generally somewhat behind tip of pectoral, and ending under about next to last ray of dorsal, its 2 spines in adult males with fleshy bulbs covered with folded skin, undeveloped in individuals less than about 80 mm. long; base of anal 2.1 to 2.3 in length; ventral fairly short, with 3 rays, the inner one notably longer than the others, 1.5 to 1.9 in head; pectoral moderately large, the longest rays below middle of fin, about as long as head, 3.8 to 4.5 in length.

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[24] As the specimens recorded by Jordan and Gilbert are not available for examination at present, their identity remains doubtful. There is nothing in the brief account offered that is in disagreement with the specimens herein described as *S. gigas*, except the statement that canine teeth were absent; these may have been broken or possibly were overlooked. Several specimens (U. S. N. M. No. 88792) from Juan Fernández, the type locality of *S. rubropunctatus*, have been examined and are believed to be that species. These have notably longer pectoral and caudal fins than *gigas*, the forehead is broader and rounder, and a longer fringe of cirri is present at the nape. A distinct canine tooth is present in posterior part of lower jaw.

Color of the larger specimens uniform grayish brown, paler underneath; fins of about same color as adjacent parts of body, exclusive of anal which is darker. Small specimens (less than about 75 mm. long) lighter, with dark blotches on back below base of dorsal, and another series along middle of side, the blotches of the two series tending to unite to form cross bars posteriorly; a dark spot behind eye; dorsal with a vertically elongate dark spot between the first two spines; base of spinous part of dorsal with a light streak.

Nineteen specimens, 38 to 260 mm. (30 to 210 mm. to base of caudal) long, are included in the collection furnished by the Mission, which were taken at Guañape Island, in Samanco Bay, at Callao, at La Lagunilla, and in San Juan Bay. Six specimens, 55 to 235 mm. (45 to 196 mm. to base of caudal) long, collected by R. E. Coker at Lobos de Afuera Island, at Ballestas Island, and at Santa Rosa Island, Peru; an example, 60 mm. (50 mm. to base of caudal) long, from Lobos de Afuera, Peru; and 3 examples, respectively 123, 142, and 145 mm. (104, 118, and 123 mm. to base of caudal) long, all taken by W. L. Schmitt at Guayaquil, Ecuador, also were examined. The proportions and enumerations are based on 21 specimens, including the extremes in length.

Nichols and Murphy (see reference above) say, "'Borracho' means drunk, and eating this fish is supposed to make one sleepy and to cause dreams. A meal of them acts like a heavy dose of a narcotic, according to the Indians at Chincha Islands." Yet, in the report of the Mission (1943, p. 279) a considerable quantity is said to have been marketed in 1940. Landings were made principally at Talara and at Sechura. It, of course, is possible that more than one species of blenny is included in the catch, as those of the genus *Labrisomus* also grow large.

Range.—Coasts of Ecuador, Peru, and Chile and northward to Panama, many specimens from Balboa being at hand. Previously not recorded from Ecuador.

SCARTICHTHYS EQUES (Steindachner)

Salarias eques STEINDACHNER, 1898, p. 307, pl. 19, figs. 5, 5a, Iquique, Chile (original description).

A specimen 53 mm. (43 mm. to base of caudal) long, taken by the Mission at North Chincha Island, agrees well with Steindachner's description and figure. Structurally it is so closely related to *S. gigas* that it does not seem necessary to give a detailed description. The forehead apparently is a little steeper and broader than in specimens of *gigas* of about the same size; the tentacle on upper part of eye, although identical in structure is shorter, being only a little more than half length of eye, instead of nearly as long as eye; there are only two simple tentacles at nape as in small examples of *gigas*, though rather shorter; and the pectoral fin is notably shorter than head, instead of being about as long as head.

Slight differences in proportions and enumerations between *eques* and *gigas* are evident from the figures that follow. The proportions and enumerations, given second in each instance, are based on a specimen of *gigas* 63 mm. long, which is nearest the size of the one of *eques* of any now at hand. Head 3.65, 3.9 in length; depth 3.8, 4.1; base of anal 2.25, 2.5; pectoral 5.4, 4.5; caudal 4.3, 3.85. Eye 3.4, 3.9 in head; snout 2.6, 3.0; interorbital 11.8, 16.7; maxillary 3.7, 3.6; caudal peduncle 3.0, 3.6; ventral 2.0, 1.6; pectoral 1.5, 1.15. D. XII, 16, XII, 16; A. II, 19, II, 18; P. 14, 14.

In color *eques* differs prominently from *gigas*, the ground color being pale olivaceous, probably yellowish in life. A prominent dark band is present on the back, beginning on the interorbital and ending somewhat in advance of last rays of dorsal. A second prominent dark band extends from the forehead through the eye to base of caudal; rather broader than eye anteriorly, becoming very narrow posteriorly. A black spot within the dark band is evident behind the eye. An indefinite dark horizontal stripe extends from the premaxillary to margin of opercle. The fins are pale, except the outer rays of the caudal and the margin of the anal, which are slightly dusky.

Range.—Coasts of Peru and Chile. Previously recorded only from Chile.

Genus HYPSOBLENNIUS Gill, 1861

Body elongate, compressed; head short, blunt; mouth small, horizontal; maxillary rarely extending beyond middle of eye; teeth in the jaws in a single close-set series, not freely movable; no canines; gill membranes broadly united to the isthmus, the gill openings being restricted to the sides, but extending downward to or beyond middle of base of pectoral; lateral line generally incomplete; scales wanting.

As a result of the great changes in the structures about the head, which take place during development in some, if not all, the species of this genus, a few genera based on juvenile characters apparently have been proposed. The young of at least some of the species have a prominent supraocular bony ridge (making the interorbital broad and flat), which is lost with age. They also have one or more spines along the margin of the preopercle, which are lost. The caudal fin is often if not always concave in juveniles, and convex in adults; the pectoral fins commonly are black and there is a series of prominent black spots along the base of the anal. The changes occurring during development in *H. hentz*, a species from the Atlantic, ranging from Chesapeake Bay to Florida, have been described in detail by Hildebrand and Cable (1938, pp. 576–589). As already suggested by Norman (1943, p. 802), *Spinoblennius* Herre (1935), with *S. spiniger* as the type, of which a paratype is before me, quite surely is a juvenile of this genus. The same applies to *Hypsoblenniops* Schultz (1942), with *H. rickettsi* as its type, of which several paratypes are now before me.

Two and possibly three species come within the scope of the present work.

KEY TO THE SPECIES

a. A shallow groove across head behind eyes; gill opening not extending across lowermost ray of pectoral; orbital tentacle longer than eye.
paytensis (p. 390)

aa. No groove across head behind eyes; gill opening extending below lowermost ray of pectoral.

  b. Dorsal with 16 or 17 soft rays; anal with 20 or 21 rays; orbital tentacle shorter than eye______________________**robustus**, new species (p. 391)

  bb. Dorsal with 14 to 16 soft rays; anal with 18 to 20 rays; interorbital broad, flat, 4.0 to 4.6 in head__________________species? (juveniles) (p. 393)

HYPSOBLENNIUS PAYTENSIS (Steindachner)

Blennius (*Hypleurochilus*) *paytensis* STEINDACHNER, 1876, p. 171, Paita, Peru (original description).

Hypleurochilus paytensis STARKS, 1906, p. 800, Paita, Peru (number of dorsal and anal rays stated for two specimens, but no description offered).

Head 4.0; depth about 4.5; D. XII, 17; A. 21; P. 14.

Head with a shallow groove behind eyes; snout short, high, steeper in adults than in young; eye 4.0 in head; interorbital concave, half or a little less than half diameter of eye; maxillary reaching past anterior margin of eye; no posterior canines; nasal tentacle short, fringed;

orbital tentacle divided into three parts nearly to base, each part fringed, the first highest in females, the first and second of equal length in males, very long, 1.5 to 2.5 times length of eye; gill opening not extending to base of lowermost pectoral ray; lateral line ending well in advance of midlength of body; dorsal beginning at vertical from margin of preopercle, the fourth spine highest, higher in males than in females, less than two in head in males, exactly two in females; soft part of dorsal marked by a moderately deep notch; caudal free from dorsal and anal, or occasionally attached by membrane to the dorsal, its margin convex, about two-thirds length of head; seventh or eighth ray of pectoral longest, reaching origin of anal.

Color light grayish yellow, with dark-brown marblings; a large brown spot, with a sky-blue speck in anterior part, behind eye; three or four dark bands on side of head below eye; an indigo-brown spot between the first three spines of dorsal in males.

This species was not secured by the Mission, and as no specimens are available to me the description offered was translated, rearranged, and condensed from Steindachner's original account.

Starks (see reference above), who reported two specimens from Paita, the type locality, gave the dorsal rays as 15 and 17, and the anal rays as 20 in each specimen.

Range.—Known only from Paita, Peru.

HYPSOBLENNIUS ROBUSTUS, new species

FIGURE 75

Head 3.3 to 3.5; depth 4.1 to 4.2; D. XII, 16 or 17; A. 20 or 21; P. 14 or 15.

Body moderately compressed, rather robust, its greatest thickness about three-fourths its depth; head short, deep, its outline very steep in front of eyes, then gently convex, without a cross groove behind eyes; caudal peduncle strongly compressed, 3.1 to 3.5 in head; snout very blunt, 3.4 to 4.3; eye 3.2 to 3.5; interorbital about 16 to 23; mouth horizontal; lower jaw slightly included; maxillary reaching below middle of eye 3.0 to 3.5 in head; teeth in each jaw in a single close-set series, slightly compressed, no canines; lips not fringed; anterior nostril with a low tube and a tentacle about as long as pupil; tentacle on upper margin of eye about two-thirds length of eye, simple, bifid or trifid; gill opening notably broader than base of pectoral, extending below lowermost ray of pectoral; lateral line well developed anteriorly, with a downward curve, and a few pores forming a short straight section on middle of side, reaching beyond beginning of soft part of dorsal; dorsal fin beginning about over margin of preopercle, moderately notched, the spines fairly slender, the longest ones at about middle of spinous part, 2.5 to 2.8 in head; soft part of dorsal about as long as spinous part, and higher, the longest rays as long as postorbital part of head; caudal round, entirely free from dorsal and anal, about as long as postorbital part of head and half the eye; anal long and low, its base 2.1 to 2.5 in length; ventral moderate, 1.4 to 1.7 in head; pectoral broad, 1.2 to 1.3 in head, 3.9 to 4.6 in length.

Color variable, grayish to brownish; back with six or seven irregularly shaped dark bars, some of them extending down to about middle of side; side with many other irregular dusky markings, one specimen with dark blotches on lower part of side somewhat connected with the dark "saddles" on back; head somewhat dusky above, with a vertically elongate dark spot behind lower part of eye, sides and lower surface of head merely with dark dots, or the dots on lower surface arranged to form two or three cross streaks; dorsal and caudal translucent, with dark punctulations along the spines and rays, forming indistinct scattered spots, and cross lines on the caudal fin in two specimens at hand; anal dusky (quite dark in one specimen) with a pale margin; ventral dusky, the rays with pale tips; pectoral translucent, with dusky points, and one specimen with indefinite dark cross bars.

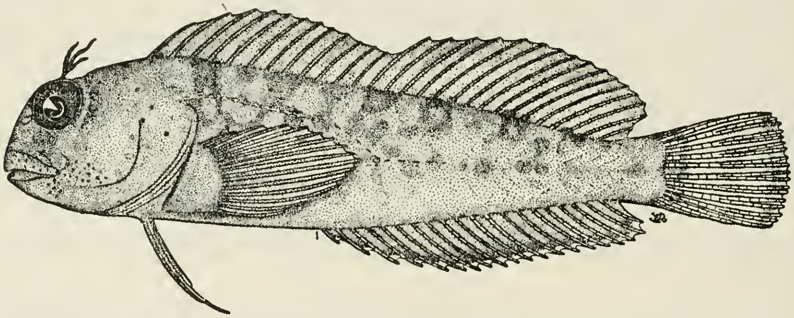

FIGURE 75.—*Hypsoblennius robustus*, new species. From the type, 39 mm. long, Independencia Bay, Peru (U.S.N.M. No. 128196).

A juvenile, 19 mm. long, retains three spines on the preopercular margin, the nasal and ocular tentacles are simple and notably shorter than in the larger specimens, and the color is rather pale. However, the dark "saddles" on the back are somewhat evident anteriorly; large dark chromatophores are present on the head behind the eyes; dark dots form indistinct dark cross lines on lower surface of head; the lower half or so of the pectoral remains dark (though somewhat broken up into dots) as in juveniles of several species of blenny; and the dark dots of juveniles remain, in part, on the base of the anal.

This species has been described from four specimens. Three of these, respectively 19, 39, and 42 mm. (16, 32, and 35 mm. to base of caudal) long, were secured by the Mission at Talara, Callao, and Independencia Bay; and one specimen, 29 mm. (23 mm. to base of caudal) long, was taken by R. E. Coker at Chimbote. The specimen from Independencia Bay (U. S. N. M. No. 128196), which is 39 mm. long, has been selected as the type. The following proportions and enumerations apply to the type: Head 3.5 in length; depth 4.1; anal base 2.15; pectroal 4.4. Eye 3.6 in head; snout 3.4; interorbital 18; maxillary 3.0; caudal peduncle 3.1; longest dorsal spine 2.5; ventral 1.4; pectoral 1.25. D. XII, 16; A. 21; P. 14.

The species as represented by the specimens just described, seems to differ from *H. paytensis*, known to me only from the original description, in lacking a cross groove behind the eyes and in having a larger head, larger eye, a much shorter orbital tentacle, and lower dorsal spines, as shown in the descriptions. It differs from *H. lignus* Meek and Hildebrand, from Panama Bay, in the absence of a cross groove behind the eyes in having a broader gill opening (not reaching below lowermost ray of pectoral in *lignus*), and in having more anal rays (17 to 19 in *lignus*).

The species was named *robustus* because of the plump, robust body.

Range.—Known from Talara, Callao, Chimbote, and Independencia Bay, Peru.

HYPSOBLENNIUS species (juveniles)

Head 3.7 to 4.3; depth 4.25 to 4.6; D. XII, 14 or 15 (one specimen with 16); A. 18 to 20; P. 14 (one specimen with 13).

Body anteriorly robust, compressed; head short, broad, anteriorly nearly vertical; no cross groove behind eyes; caudal peduncle strongly compressed, 4.0 to 4.6 in head; snout very blunt, 4.5 to 5.1; eye 2.7 to 3.2; interorbital 4.0 to 4.6; mouth horizontal, terminal; maxillary reaching anterior margin of pupil, 3.6 to 4.2 in head; teeth in a single close-set series in each jaw; no canines evident; preopercle with 3 well-developed spines, the middle one largest; anterior nostril with a small flap behind it; tentacle on upper margin of eye very small, less than half length of pupil in the larger specimens, visible, though only a mere point, in specimens 15 mm. long, not evident in the smallest ones; gill opening fairly large, extending below lowermost ray of pectoral; lateral line not evident in all the specimens, very short if present; dorsal beginning over, or somewhat behind, margin of preopercle, moderately notched; base of soft part of about same length as that of spinous part, the longest rays somewhat higher than the longest spines; caudal slightly concave in the smallest specimens, straight to convex in the larger ones, rather far removed from the dorsal and anal; anal long and low, its base 2.3 to 2.6 in length; ventral moderately long, the longest rays distally free, 1.2 to 1.4 in head; pectoral large, about as long as head, 3.7 to 4.25 in length.

Color not fully developed; body unpigmented, except in the two largest ones, these with six more or less definite dark "saddles" on back composed of somewhat disconnected spots, these specimens also with three to five rather obscure dark spots on middle of side under posterior rays of dorsal; head with dark marking, these more numerous in the largest specimens than in the smallest ones; dorsal and ventral unpigmented; caudal unpigmented, except for a dark vertical line on its base; anal plain, except for a black spot with a backward extension at the base of each ray; lower half of pectoral in the larger specimens, and nearly the entire fin in the smallest ones, black.

The description is based on 10 juveniles, 8 to 21 mm. (6 to 18 mm. to base of caudal) long, taken by the Mission. Eight specimens were caught in a surface net off Sechura Bay, at latitude 5°52′30″ S.; longitude 81°28′30″ W., and two under a light at Mazorka Island in the Huaura group. These specimens all retain some of the juvenile characters, such as the prominent bony ridges over the eyes; the juvenile color markings consist of the conspicuous black pectoral fins and the prominent series of dark dots along the base of the anal, while general pigmentation is lacking.

I am unable to identify these juveniles with any known species, and I defer giving them a name, because of the pronounced changes which are known to take place during development in at least some of the blennies. The fins are well enough developed, except for the spinous part of the dorsal in the three smallest specimens, to permit an accurate enumeration of the rays. However, it is not possible to definitely distinguish these specimens from the known species on the basis of the number of fin rays alone. The specimens seem to be near the form herein described as *H. robustus.* Although the soft rays in the dorsal apparently are rather fewer, they overlap in one specimen. Furthermore, the collections contain one specimen of *robustus*, only 19 mm. (16 mm. to base of caudal) long, in which the bony ridges over the eyes, if it ever had them, have disappeared, and the interorbital instead of being broad and flat is narrow and concave. However, it does retain three spines on the margin of the preopercle. If the differences in the structures of the interorbital are of no specific value, it must be assumed that development progresses very unequally among individuals of the same species. The material now at hand does not seem to justify any definite conclusion.

Range.—Coast of Peru.

Family CLINIDAE

Body oblong or elongate; premaxillaries generally more or less protractile; teeth in the jaws in an outer principal series, followed anteriorly by a band of small pointed teeth; teeth often present on vomer and palatines; gill membranes united and free from the isthmus; scales usually, though not always, present; spinous part of dorsal longer than soft part, all the rays or nearly all of them spinous in some of the genera; caudal usually free, with about 13 principal rays; anal long, with 1 or 2 weak spines; ventral fins jugular, with a small spine and 3 or 4 simple rays; pectoral rather large, with a broad base.[25]

KEY TO THE GENERA

a. Scales present; lateral line present, complete; 1 or 2 rows of tentacles at nape; maxillary extending under eye____________________ **Labrisomus** (p. 395)
aa. Scales missing; no lateral line; no tentacles at nape; maxillary extending beyond posterior margin of eye__________________ **Emblemaria** (p. 403)

Genus LABRISOMUS Swainson, 1839

Body oblong, rather robust; head compressed, though often broader than trunk, becoming deeper and blunter with age in some species; premaxillaries protractile; mouth moderately large; each jaw with a series of rather prominent teeth near outer rim, generally followed anteriorly by a band of minute teeth; vomer, and usually palatines, with teeth; gill membranes united, and free from the isthmus; lateral line complete, curved anteriorly; anterior nostril with a tuft of tentacles, upper posterior part of eye with a few to a dozen or more tentacles; nape usually with 1 or 2 rows of tentacles (few or missing in *microcirrhis*); scales small, cycloid, generally missing on head, usually encroaching on vertical fins in adults; dorsal fin long, composed of about 18 to 25 spines, and 11 to 13 soft rays in Peruvian species; anal long, with 2 spines and about 18 to 23 soft rays; caudal separate from dorsal and anal, rounded or truncate.

Four species are included in the collections from Peru available for study, one of which appears to be new.[26]

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[25] Cope (1877, p. 26) described a blenny from Pacasmayo Bay, Peru, which he named *Blennius tetranemus*. I am unable to determine from the description whether it belongs to the Blenniidae or to the Clinidae, and no specimens identifiable with the description are included in the Peruvian collections studied. The fin formulae at least suggest Clinidae. The description that follows, apparently based chiefly on a specimen 73 mm. long, was modified after the original. No further mention will be made of this species. Head 3.5; depth 4.0; D. XIX, 13; A. II, 18; P. 13. Eye a little more than a fourth the length of head; interorbital narrow, deeply grooved; a transverse groove behind orbits; only 1 of 7 specimens with a pair of curved teeth behind premaxillaries; none on lower jaw; a slender tentacle behind nostril, and a long one over posterior part of orbit, deeply split into 4 subequal portions, no fringes at its base or behind orbit; origin of dorsal above margin of preopercle, many of the rays of subequal length; an open notch between the first and the more elevated second dorsal. Color light brown; sides marbled with darker brown; 7 quadrate spots along base of dorsal; sides of head speckled with dark brown; a large brown spot behind eye, separating 2 wide light bars, one extending back and the other downward and backward from eye; dorsal with obscure brown shades; anal dusky, with a light margin.

[26] Cuvier and Valenciennes (1836, p. 383) described *Clinus peruvianus* from a drawing. It was based on a blenny with scales, and probably has been correctly referred to *Labrisomus* by authors. No specimens studied are identifiable with this species. The description contains little that is diagnostic, other than the number of fin rays, which are given as follows: D. XVIII, 11; A. 23, probably II, 21; C. 11; P. 10; V. 2. Even these may not have been correctly shown in the drawing. One may especially question the small number of pectoral rays, which is quite out of line with the species of this genus from the west coast of America represented in the collection of the U. S. National Museum. Because of the probable inaccuracies in the description, no further mention of *Clinus peruvianus* will be made.

KEY TO THE SPECIES

a. Dorsal fin usually with 13 soft rays (rarely with 12 or 14); scales (or pores) in lateral line 63 to 75.

b. Pectoral with 15 rays (rarely with 16); scales in lateral line larger than adjacent ones, especially in curved part, 68 to 75 in lateral line, 90 to 105 just above it, about 14 or 15 oblique rows between lateral line and sixth dorsal spine; teeth on vomer in a band-------- **philippii** (p. 396)

bb. Pectoral with 14 rays; scales in lateral line not much larger than adjacent ones, 63 to 68 in lateral line, 65 to 73, just above it, 7 or 8 oblique rows between lateral line and sixth dorsal spine; teeth on vomer in a single series-- **xanti** (p. 398)

aa. Dorsal fin with 11 soft rays; scales (or pores) in lateral line 57 to 62.

c. Dorsal fin with 19 spines, its spinous part with two indentations, the third and the fifteenth and sixteenth spines shorter than the others; jaws with a single series of teeth; pectoral with 14 to 15 rays.
afuerae, new species (p. 400)

cc. Dorsal fin with 24 or 25 graduated spines, its spinous part being unindented; jaws with an outer series of large teeth followed by a band of minute ones; pectoral with 13 rays------------------ **microcirrhis** (p. 401)

LABRISOMUS PHILIPPII (Steindachner)

TRAMBOLLO; CHALAPO

FIGURE 76

Clinus philippii STEINDACHNER, 1866, p. 3, West Coast of South America (original description).

Clinus fortidentatus COPE, 1877, p. 26, Callao Bay, Peru (original description).

Labrisomus philippi ABBOTT, 1899, p. 361, Callao, Peru (note on food eaten).—STARKS, 1906, p. 800, Callao, Peru (enumeration of fin rays; notes on variation).

Lepisoma philippi EVERMANN and RADCLIFFE, 1917, p. 144, pl. 13, fig. 1, Chimbote, Callao, Chincha Island, Ballestas Island, and Independencia Bay, Peru (synonymy; description; compared with *Lepisoma xanti* and *L. jenkinsi*).

Head 3.1 to 3.6; depth 3.1 to 4.1; D. XVIII or XIX, 13 (occasionally 12, rarely 14); A. II, 19 (occasionally 18 or 20); P. 15 (rarely 16); scales (pores) in lateral line 68 to 75, just above lateral line about 90 to 105; vertebrae 35 (one specimen dissected).

Body elongate, moderately compressed, its greatest thickness about two-thirds its depth; head moderately low, tapering to a rather pointed snout in small specimens, becoming much deeper and blunter with age, broader than anterior part of trunk; caudal peduncle short, compressed, 3.1 to 3.6 in head; snout pointed in small examples, quite blunt in large ones, 2.5 to 3.4 in head; eye 4.0 to 6.1; interorbital increasing greatly in width with age, 4.6 to 11; mouth large, slightly oblique, terminal or nearly so; maxillary reaching anterior margin of pupil in small examples, to or beyond posterior margin of pupil in larger ones, 1.75 to 2.5 in head; teeth in each jaw in an outer series, consisting of rather strong teeth, followed anteriorly by a band of minute teeth; those on vomer and palatines in bands, the outer ones on vomer little enlarged; anterior nostril with a tuft of about 6 to 12 tentacles, about as long as pupil; upper part of eye with a tuft of about 8 to 13 tentacles, about half length of eye; nuchal "comb" consisting of about 13 to 24 tentacles on each side, generally rather less than half length of eye; the tentacles in each group becoming more numerous with age; gill rakers shorter than pupil, about 8 on lower limb, and about 4 on the upper one, of first arch; lateral line curved anteriorly, reaching middle of side and becoming straight over anterior part of anal, well behind tip of pectoral, the chord of curved part about equal to length of straight part; pores and tubes on head numerous; scales quite small, not extending on head, except for a few on preopercle in some specimens, reduced above lateral line on anterior part of body, making an accurate enumeration difficult, about 14 or 15 oblique rows between lateral line and sixth dorsal spine, those in lateral line modified, larger than adjacent ones and with straight or concave free margins; dorsal fin beginning over or a little in advance of margin of preopercle, the spines stiff, graduated, the longest ones near middle of spinous part of fin, 2.9 to 3.7 in head, the soft part of fin much shorter and notably higher than spinous part; caudal broadly rounded, nearly as long as head without snout; anal beginning under middle of spinous part of dorsal, and ending about under next to the last ray of dorsal, its base 2.1 to 2.4 in length; ventral rather long, 1.5 to 1.75 in head; pectoral broad, its longest rays near middle of fin, 1.2 to 1.4 in head, 3.9 to 4.8 in length.

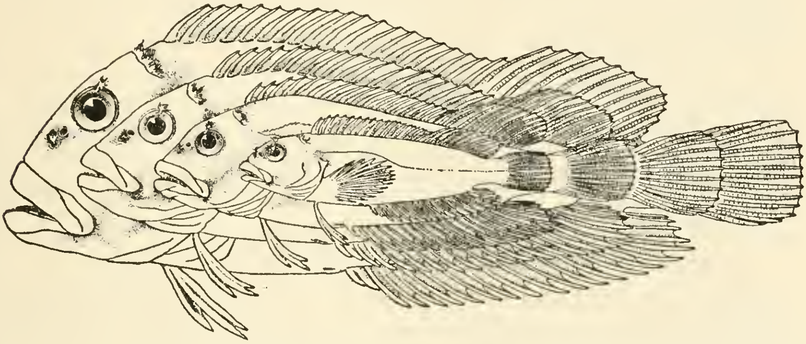

FIGURE 76.—*Labrisomus philippii* (Steindachner). From specimens 290, 245, 170, and 112 mm. long, Peru (U.S.N.M. Nos. 77692, 77606, 77670, and 77562), showing change in form and depth with age. (After Evermann and Radcliffe, 1917.)

Color variable, olivaceous to rather dark brown; with or without dark spots and bars; plain specimens generally with dark unspotted fins; barred and spotted specimens with few to many dark spots on fins; dark bars of body often extending on dorsal fin; lips and lower parts of head sometimes with dark stripes; side of head often with black spots; anal sometimes with a row of pale spots.

This blenny evidentally is common on the coast of Peru, as many specimens are included in the collection made by the Mission, by R. E. Coker, and by others. The proportions used in the description are based on 16 specimens, 53 to 310 mm. (45 to 260 mm. to base of caudal) long, and the enumerations are founded on 25 examples. The specimens studied were collected in Lobos de Tierra Bay, Lobos de Afuera Bay, Chimbote Bay, at Callao, North Chincha Island, "Chincha Islands," Point Ripio, La Lagunilla, Pisco, and in Independencia Bay.

This species differs from the other local forms in having smaller scales, which are especially small above the lateral line on the anterior part of back, and in having more rays in the pectoral fin, 15 being present in 44 specimens examined and 16 in three others. The difference in the shape of the head, which the species undergoes with age and growth, as indicated in the description, is remarkable. A large size, for a blenny, as already indicated, is attained.

Range.—Coast of Peru; also listed from Coquimbo, Chile, by Delfin (1901, p. 94).

LABRISOMUS XANTI Gill

TRAMBOLLO

Labrosomus xanti GILL, 1860, p. 107, "Cerro Blanco," Mexico (original description).

Lepisoma xanti EVERMANN and RADCLIFFE, 1917, p. 143, Lobos de Afuera, Peru (description).—NICHOLS and MURPHY, 1922, p. 513, South Guañape Island and South Chincha Island, Peru.

Labrisomus xanti MEEK and HILDEBRAND, 1928, p. 937, pl. 94, fig. 2, Panama Bay (synonymy; description; compared with *L. nuchipinnis;* range).

Head 2.8 to 3.4; depth 3.6 to 5.1; D. XVIII, 13 (occasionally 12); A. II, 18 or 19; P. 14; scales in lateral line (pores) 63 to 68, just above lateral line 65 to 73; vertebrae 32 (one specimen dissected).

Body elongate, moderately compressed, its greatest thickness about two-thirds its depth; dorsal outline of head ascending rather rapidly in front of eyes, gently convex from interorbital to dorsal fin; head fairly large, rather broader than anterior part of trunk; caudal peduncle short, compressed, 3.4 to 4.1 in head; snout somewhat pointed, 2.9 to 3.8; eye 3.1 to 5.3; interorbital 10.8 to 14; mouth large, almost horizontal, terminal, or lower jaw projecting slightly; maxillary reaching to or beyond middle of eye, 2.0 to 2.5 in head; teeth in each jaw in an outer series, consisting of enlarged teeth, somewhat compressed at base and curved, followed anteriorly by a band of minute teeth; those on vomer in a single series, rather stout conical, the anterior (median) one enlarged; those on palatines rather smaller, generally in 2 or 3 irregular series; anterior nostril with a tuft of 6 to 8 tentacles, about as long as pupil; upper posterior part of eye with a tuft of about 8 to 16 tentacles, fully half length of eye; nuchal "comb" consisting of about 16 to 24 tentacles on each side, about half length of eye; gill rakers scarcely as long as pupil, about 7 on lower and about 3 on upper limb of first arch; lateral line curved anteriorly, reaching middle of side and becoming straight over anterior part of anal, chord of curved part and straight part of about equal length; pores and tubes numerous on head; scales moderately small, thin, not extending on head, not greatly reduced above lateral line, 7 or 8 oblique rows between lateral line and sixth dorsal spine, those in lateral line little modified, scarcely larger than the others on middle of side; dorsal fin beginning over margin of preopercle, the spines stiff, graduated, the longest ones at or behind middle of spinous part of fin, 2.7 to 3.1 in head, the soft part much shorter and notably higher than the spinous part; caudal broadly rounded, about as long as head without snout; anal beginning under middle of spinous part of dorsal and ending about under next to last ray of dorsal, highest posteriorly, its longest ray scarcely shorter than the longest one of dorsal, its base 2.2 to 2.5 in length; ventral rather long, 1.4 to 1.75 in head; pectoral large, the longest rays below middle of fin, 1.25 to 1.4 in head, 4.2 to 4.6 in length.

Color variable, light to dark brown; the smaller specimens nearly all with irregular dark cross bars, more or less broken up into spots in some individuals; some specimens with irregular light markings; side of head generally with two or three dark streaks; fins plain light olivaceous to rather dark brown, with or without dark and light spots, those on pectoral, if numerous, arranged to form cross lines; pectoral generally with a dark line across base. The two largest specimens at hand nearly uniform brown; soft part of dorsal and caudal with pale spots; anal dark; pectoral with dark streak across base.

This species is represented in the collection made by the Mission by 13 rather small specimens, 43 to 82 mm. (37 to 77 mm. to base of caudal) long, collected in rocky coves in Lobos de Tierra Bay and in Lobos de Afuera Bay. Three larger specimens, two 140 and 180 mm. (118 and 152 mm. to base of caudal) long, collected at Paita by W. L. Schmitt, and one 145 mm. (119 to base of caudal) long, from Lobos de Afuera Island, secured by R. E. Coker, also were studied. This material forms the basis for the foregoing description.

The Peruvian specimens were compared with others from Guayaquil, Ecuador, Panama Bay, and Mexico. The specimens from Guayaquil are in entire agreement with the Peruvian examples. However, the ones from Panama Bay and Mexico seem to have a rather broader interorbital, and the eye, snout, and maxillary perhaps are a little longer. Furthermore, the specimens from the last-mentioned localities have the palatine teeth in narrow bands, rather than in two or three series as in the Peruvian examples. When more specimens of nearly equal size become available, it may be possible to show that the inhabitants of the two general regions named are subspecifically distinct.

Range—Gulf of California to Peru.

LABRISOMUS AFUERAE, new species

Figure 77

Head 3.0 to 3.5; depth 3.6 to 3.8; D. XIX, 11; A. II, 18 to 20; P. 14 to 15; scales in lateral line (pores) 57 to 59, just above lateral line 58 to 63; vertebrae 34 (one specimen dissected).

Body moderately elongate, compressed, its greatest thickness somewhat less than two-thirds its depth; dorsal outline ascending rather rapidly in front of eyes, slightly convex from interorbital to dorsal fin; head compressed, a little broader than anterior part of trunk; caudal peduncle short, compressed, 3.1 to 3.4 in head; snout fairly blunt, 3.1 to 3.6; eye 3.1 to 3.6; interorbital 11 to 14.5; mouth moderate, terminal, slightly oblique; lips fairly thick; maxillary reaching nearly or quite to anterior margin of pupil, 3.0 to 3.5 in head; teeth in each jaw in a single series (not followed by a band of minute teeth); a few blunt teeth on vomer, and none on palatines; anterior nostril with a few tentacles, about as long as pupil; upper posterior part of eye with about 4 or 5 tentacles, fully half length of eye; nuchal "comb" consisting of about 12 tentacles on each side, the longest one nearly as long as eye; gill rakers slender, almost as long as pupil, about 8 on lower limb, and 4 on upper one, of first arch; lateral line curved anteriorly, reaching middle of side and becoming straight over anterior part of anal, and slightly behind tip of pectoral, chord of curved part longer than straight part; scales moderately large, not especially reduced anteriorly above lateral line, 6 rows between lateral line and sixth dorsal spine, those in anterior part of lateral line enlarged, with free margins concave; dorsal beginning a little behind margin of preopercle, the spines sharp, the spinous part indented anteriorly and posteriorly, the third spine being notably shorter than the fourth, and the third and fourth from the last one also being considerably shortened, the longest ones near middle of spinous part of fin, 2.3 to 3.2 in head, the soft part much higher than spinous part; caudal with

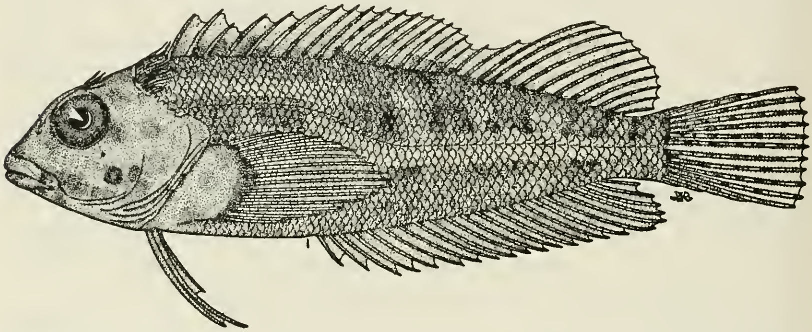

Figure 77.—*Labrisomus afuerae*, new species. From the type, 53 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 128213).

nearly straight margin about as long as head without snout; anal beginning somewhat in advance of spinous part of dorsal, its longest rays a little shorter than those of dorsal, its base 2.0 to 2.2 in length; ventral nearly reaching vent, 1.0 to 1.4 in head; pectoral large, reaching beyond origin of anal, nearly to beginning of straight part of lateral line, 1.1 to 1.25 in head, 3.75 to 4.0 in length.

Color brownish, with two light longitudinal bands, one on upper part and another on lower part of side; a series of dark spots on back, another along middle of side, and a third one on lower part of side, the spots irregular in shape, tending to form cross bars posteriorly above lateral line; lower parts of head with dark streaks and dots; fins paler than body, dorsal, caudal, and anal with dark spots, the anal tending to become plain dusky anteriorly; ventral dusky; pectoral with a curved dark streak at base, and with suggestions of dark spots or cross streaks on fin.

This species is represented by three specimens, 52, 53, and 55 mm. (42, 43, and 45 mm. to base of caudal) long, collected by the Mission at Lobos de Afuera Island. The 53-mm. specimen (U.S.N.M. No. 128213) has been chosen as the type. The following proportions and enumerations apply to this specimen: Head 3.5 in length; depth 3.6; pectoral 3.75; base of anal 2.0. Eye 3.1 in head; snout 3.1; interorbital 11; maxillary 3.0; caudal peduncle 3.1; ventral 1.4 pectoral 1.1. D. XX, 11; A. II, 20; P. 15; scales in lateral line (pores) 59, just above lateral line 58, rows between lateral line and sixth dorsal spine 6.

This species differs from the other local forms in the absence of villiform teeth in the jaws behind a rather prominent series near the outer rim of the jaws,[27] and in the doubly indented spinous portion of the dorsal. The small number of soft rays in the dorsal fin distinguishes this species from *L. xanti* and *L. philippi*, but not from *L. microcirrhis*. However, its fewer dorsal spines readily differentiate it from that species. It seems to be nearest *Lepisoma jenkinsi* Heller and Snodgrass from the Galápagos Islands, with which it agrees in the number of scales and fin rays but differs in the absence of bands of villiform teeth in the jaws, in having a smaller mouth (maxillary reaching to or beyond middle of eye in *L. jenkinsi*), and in the indented spinous part of dorsal.

Range.—Known only from Lobos de Afuera Island, Peru.

LABRISOMUS MICROCIRRHIS (Cuvier and Valenciennes)

TRAMBOLLO

Clinus microcirrhis CUVIER and VALENCIENNES, 1836, p. 384, Valparaiso, Chile (original description).—COPE, 1877, p. 26, Callao Bay, Peru (number of fin rays stated).

Head 3.3 to 3.5; depth 3.8 to 4.2; D. XXIV or XXV, 11; A. II, 21 to

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[27] It was thought that the absence of villiform teeth in the jaws might be due to the small size (youth) of the specimens. However, upon the examination of examples equally small of *L. xanti* and of *L. philippi* it was found that in small specimens of those species such teeth already are definitely developed. It is unlikely therefore, that their absence in the specimens under discussion can be ascribed to youth.

23; P. 13; scales (pores) in lateral line 61 or 62, just above lateral line 77 to 84; vertebrae 40 (one specimen dissected).

Body elongate, moderately compressed, its greatest thickness about three-fourths its depth; dorsal outline gently convex; head low, tapering to a rather pointed snout (not becoming deep with age), broader than anterior part of trunk, about equal in width and depth at nape; caudal peduncle short, strongly compressed, 3.55 to 4.0 in head; snout rather pointed, 3.2 to 3.5 in head; eye 6.1 to 6.3; interorbital 12.1 to 13.6; mouth moderately large, oblique; lips thick; lower jaw projecting; maxillary reaching to or somewhat beyond middle of eye, 2.0 to 2.1 in head; teeth in each jaw in an outer series consisting of slightly enlarged teeth followed anteriorly by a band of minute teeth; those on vomer and palatines minute, in bands, the vomerine band well separated from the palatine bands; anterior nostril with a tuft of minute tentacles; upper posterior part of eye with one or two minute tentacles; nuchal "comb" absent or represented by a tuft of minute tentacles at each side of midline; gill rakers developed as spiny tubercles, about nine on lower limb and about two on upper one of first arch; lateral line curved anteriorly, reaching middle of side and becoming straight over beginning of about second fourth of anal, far behind tip of pectoral, the straight part shorter than curved portion; pores on head numerous, some of them in ridges and papillae; scales thin, only moderately small, not extending on head, eight or nine oblique rows between lateral line and sixth dorsal spine, those in anterior part of lateral line enlarged, and with free margins straight or concave; dorsal beginning over or slightly behind margin of preopercle, the spines rather strong, sharp, graduated, the longest ones near middle of fin, 3.3 to 3.9 in head, the soft part of fin much shorter and notably higher than spinous portion; caudal broadly convex, only about as long as postorbital part of head; anal beginning under about middle of spinous part of dorsal, and ending under next to last ray of dorsal, its base 2.3 to 3.4 in length; ventral rather short, 1.9 to 2.1 in head; pectoral broad, the longest rays at middle of fin, 1.4 to 1.5 in head, 4.8 to 5.1 in length.

Color grayish brown above, with or without dark cross bars; lower parts pale or brownish, sparingly to profusely dotted and spotted with roundish dark dots or spots; fins of about same color as adjacent parts of body.

The Mission secured four specimens, 265 to 283 mm. (230 to 243 mm. to base of caudal) long, two of which were taken in Independencia Bay, in a trammel net, and the other two in San Juan Bay, with the same gear.

Range.—Coasts of Peru and Chile.

Genus EMBLEMARIA Jordan and Gilbert, 1883

Body rather long, compressed; head rather low, compressed, pointed to rather blunt; mouth moderately large, the maxillary extending beyond posterior margin of eye; teeth in jaws consisting of a series of strong outer teeth, followed anteriorly by a band of small pointed teeth; vomer with a few minute, sometimes indefinite teeth; palatines with a series of strong teeth; gill membranes united, and free from the isthmus; no lateral line; no cirri at nape; no scales; dorsal fin long, without a definite notch, the spines flexible.

Three species come within the scope of this work, two of which appear to be new.

KEY TO THE SPECIES

a. Spinous dorsal very high anteriorly, its longest rays about as long as head; ventral fin long and broad, about as long as head; orbital tentacle simple, much longer than eye; side with dark cross bars, separated by light lines. **hudsoni** (p. 403)

aa. Spinous dorsal much lower, its longest rays notably shorter than head; ventral fin much smaller and narrower, notably shorter than head; side with a series of dark spots, but without definite bars or light vertical lines.

b. One very small, simple orbital tentacle, scarcely as long as pupl; snout, quite pointed; pectoral with 13 rays; dorsal fin anteriorly plaiin dusky without a conspicuous dark spot ------ **tortugae**, new species (p. 404)

bb. Two moderately large, fringed orbital tentacles, the anterior one the larger, about as long as eye; snout rather blunt; pectoral with 14 rays; dorsal fin not dusky anteriorly but with a conspicuous black spot between second and third spines-------------------- **bicirrus**, new species (p. 406)

EMBLEMARIA HUDSONI Evermann and Radcliffe

Trambollo

Emblemaria hudsoni Evermann and Radcliffe, 1917, p. 147, pl. 13, fig. 2, Sechura Bay, Peru (original description).

Head 4.2 to 4.5; depth 5.8 to 6.4; D. XXI to XXIII, 14 to 16; A. II), 24 to 26; P. 13; vertebrae 40 (one specimen dissected).

Body quite elongate, compressed, its greatest thickness about half its depth; head moderately compressed, its dorsal outline ascending rather rapidly to interorbital; caudal peduncle strongly compressed, 2.75 to 3.1 in head; snout fairly blunt, with a deep median groove above, extending to occiput, with a rough bony ridge on each side, 4.5 to 5.6; eye 4.7 to 5.25; interorbital 12.5 to 15.7; mouth horizontal, terminal; maxillary reaching far beyond posterior margin of eye, 1.8 to 2.1 in head; teeth in each jaw in an outer series of rather strong, short, slightly compressed teeth, not extending to angle of mouth, and followed anteriorly by a band of minute pointed teeth; vomer without definite teeth; palatines with a series of teeth rather stronger than the lateral ones in the jaws; both lips minutely fringed;

a simple tentacle, about as long as pupil, behind the very short tube of anterior nostril; a long, simple tentacle, exceeding half length of head, and reaching beyond origin of dorsal, on upper margin of eye; gill rakers small, about nine on lower and three on upper limb of first arch; dorsal fin beginning a little in advance of margin of preopercle, scarcely notched, the spinous part anteriorly high, the spine very flexible, the first one bearing membranous flaps on its anterior margin, the fourth to seventh spines highest, about as long as head, 3.4 to 4.5 in length; soft part of dorsal not well differentiated from spinous part, notably shorter than spinous part, the rays much shorter than the longest spines; caudal attached by membrane to dorsal and anal, round, only about as long as postorbital part of head; anal long and low, without differentiated spines, its base 1.75 to 2.0 in length; ventral long, rather broad, with the three rays, with broad membranes between them, extending nearly or quite to their tips, the middle one longest, about as long as head, 4.0 to 5.0 in length; pectoral moderately broad, the longest rays in lower half of fin, 1.2 to 1.75 in head, 5.2 to 7.4 in length.

Color olivaceous to brownish; side with about eight dark vertical bars, becoming mere spots posteriorly, separated anteriorly by pale lines; back with a series of indefinite dark spots, composed of dark dots; head largely dusky brown, with dark dots above, a brownish bar across preopercle and ventral surface of head, preceded by two indistinct bars across chin; anterior part of dorsal uniform dark, pale posteriorly with a few dark points on the rays; caudal and pectoral pale, anal and ventral quite dusky.

The description is based on nine specimens, 37 to 73 mm. (32 to 63 mm. to base of caudal) long, including six paratypes collected in Sechura Bay by R. E. Coker, and three specimens taken in Independencia Bay by the Mission.

Range.—Known only from Sechura Bay and Independencia Bay, Peru.

EMBLEMARIA TORTUGAE, new species

TRAMBOLLITO

FIGURE 78

Head 4.2, 4.3; depth 6.25, 6.5; D. XXII, 16, XXII, 17; A. II, about 24 (abnormal), II, 26; P. 13, 13.

Body very elongate, slender, compressed, its greatest thickness about two-thirds its depth; head long, low, moderately compressed, its dorsal outline not ascending rapidly, rather gently convex; caudal peduncle strongly compressed, 3.75, 3.75 in head; snout pointed, with a shallow median groove extending to occiput, not bordered by rough ridges, 5.4, 4.5 in head; eye 4.3, 3.8; interorbital narrow, 15, 18; mouth horizontal, terminal; maxillary reaching well beyond eye, 2.0, 1.8 in head; teeth in each jaw in an outer series of rather strong teeth, not extending to angle of mouth, followed anteriorly by a band of small pointed teeth; vomer with a few minute teeth; palatines with a series of somewhat compressed teeth, larger than the lateral teeth in jaws; both lips minutely fringed; a rather long simple (undivided) tentacle, about as long as pupil, behind the very short tube of anterior nostril; tentacle over eye simple, rather smaller than the one behind nostril; dorsal fin beginning about halfway between posterior margin of eye and margin of preopercle, only moderately notched, the spinous part not greatly elevated anteriorly, not bearing membranous flaps, the third to fifth longest, 2.0, 1.8 in head; soft part of dorsal notably shorter than spinous part, its longest rays scarcely shorter than the longest spines; caudal slightly attached by broad membranes to dorsal and anal, rather broadly convex, only about as long as postorbital part of head; anal long and low, without well differentiated spines, its base 2.0, 2.0 in length; ventral moderately long, narrow, the rays not widely separated, nor with broad membranes between them, the two longest ones distally free, the middle ray longest, about as long as head without snout, 6.2, 5.6 in length; pectoral rather broad, the longest rays in lower half of fin, 1.3, 1.3 in head, 5.5, 5.5 in length.

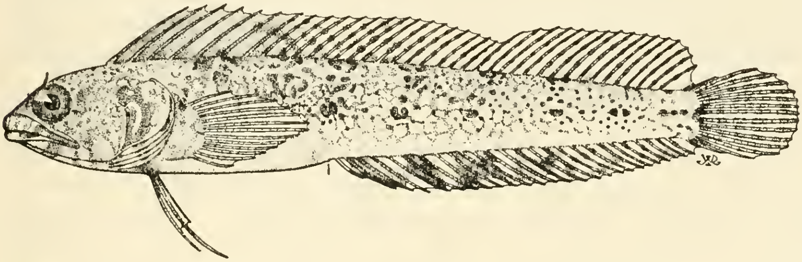

Figure 78.—*Emblemaria tortugae*, new species. From the type, 60 mm. long, Tortuga Bay, Peru (U.S.N.M. No. 128221).

Color brownish; back with seven or eight irregular dark cross blotches enclosing some of the lighter ground color; middle of side with about eight irregular dark spots, the next to the last one elongate; sides with many other dark points and lines enclosing more or less definitely diamond-shaped light areas; lower surface of head with four or five dark cross stripes; dorsal fin anteriorly largely dusky, posteriorly pale with dusky spots; caudal pale, with dusky spots on the rays forming cross bars; anal largely dusky distally, with alternating light and dark spots, at least at base; ventral dusky at base; pectoral plain.

The description is based on the type (U.S.N.M. No. 128221), from Tortuga Bay, and a paratype from Independencia Bay, respectively 60 and 48 mm. (50 and 39 mm. to base of caudal) long, both taken by the Mission. The proportions and enumerations given first in each instance apply to the type, which has a slightly abnormal anal fin, but otherwise is in good condition. It actually has only 24 rays, but in one place, where the rays are far apart, two fulcra with undeveloped rays are clearly indicated.

A third specimen, 36 mm. (31 mm. to base of caudal) long, collected in Sechura Bay by R. E. Coker, included with the paratypes of *E. hudsoni*, probably also belongs to this species. It agrees in all respects with the specimens described, except for the long, somewhat filamentous first spine of the dorsal, which possibly is characteristic of the young. The following proportions and enumerations are based on that small specimen: Head 3.9 in length; depth 7.7; base of anal 2.0; pectoral 5.3. Eye in head 4.4; snout 6.1; interorbital 26; maxillary 2.0; caudal peduncle 4.0; ventral 1.6; pectoral 1.4. D. XXII. 15: A. 26; P. 13.

This species differs from *E. hudsoni* Evermann and Radcliffe in the much more pointed snout, the notably shorter tentacle over the eye, the much less strongly elevated spinous dorsal, the narrower ventral, with the two longest rays distally free, and in color. From *E. nivipes* Jordan and Gilbert, from Panama Bay, it may be distinguished by the lower spinous dorsal, the fewer dorsal spines and more numerous soft rays, the dorsal formula for *nivipes* being XXIV, 12, and by the absence of light vertical bars on the side, having instead a series of dark spots. It differs from *E. guttata* Ginsburg, from Panama Bay, in having 13 instead of 14 pectoral rays, in the smaller, simple (unbranched) tentacle over the eye, and in the presence of dark spots on the back and reticulations on the sides. It does not have bony tubercles on the snout like *E. piratica* Ginsburg, which is also from Panama Bay.

Range.—Known only from the type material, from Sechura Bay, Tortuga Bay, and Independencia Bay, Peru.

EMBLEMARIA BICIRRUS, new species

TRAMBOLLITO

FIGURE 79

Head 4.0; depth 5.8; D. XXI, 16; A. II, 26; P. 14.

Body moderately elongate, compressed, its greatest thickness about two-thirds its depth; head short, nearly as broad as deep, its dorsal outline ascending rather rapidly to interorbital; caudal peduncle strongly compressed, 3.6 in head; snout rather blunt, with a median groove extending from anterior nostril to origin of dorsal, not bordered by rough bony ridges, 6.0 in head; eye 4.0; interorbital very narrow, 18; mouth horizontal, terminal; maxillary extending well beyond eye, 1.8 in head; teeth in the jaws consisting of an outer series of rather prominent teeth, some of the anterior ones larger than the lateral ones, caninelike; vomer with minute teeth; palatines with a series fully as strong as those in jaws; both lips minutely fringed; anterior nostril with a simple (undivided) tentacle behind a rather prominent tube, the combined length of tube and tentacle equal to two-thirds diameter of eye; 2 separate and distinct fringed tentacles on upper margin of eye, the anterior one much the larger, about as long as eye, the second one only a little more than half length of eye; dorsal fin beginning a little in advance of margin of preopercle, moderately notched, the first soft ray being considerably longer than the last spine, the spinous part not elevated, none of the spines bearing membranous flaps, the third to fifth spines longest, about as long as postorbital part of head, 1.7 in head; soft part of dorsal notably shorter than spinous part, its longest rays fully as long as the longest spines; caudal slightly attached to dorsal and anal, its margin rather strongly convex, only about as long as postoribtal part of head; anal long, of nearly uniform height throughout, its base 1.9 in length; ventral short, the principal rays free only at tip, 1.7 in head; pectoral broad at base, the longest rays in lower half of fin 1.4 in head, 5.6 in length.

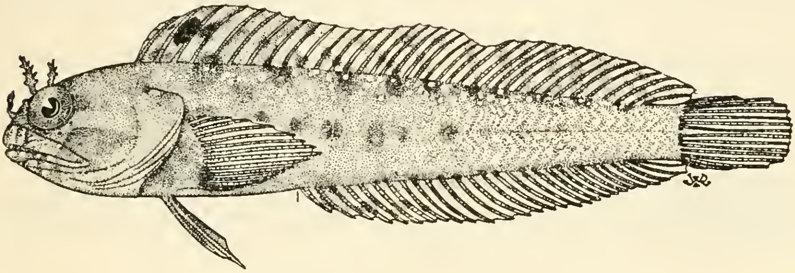

FIGURE 79.—*Emblemaria bicirrus*, new species. From the type, 35 mm. long, Independencia Bay, Peru (U.S.N.M. No. 128223).

Color olivaceous-brown; head rather darker than body; back with a series of 10 dark cross blotches, each enclosing a small light spot; middle of side with a series of dark spots, becoming obscure posteriorly; indications of light dots present on back and side; a pale, horizontally elongate area behind lower part of eye; a dark dot on posterior rim of orbit; lower surface of head with dusky cross stripes; fins mostly pale olivaceous; the dorsal with a black spot between the second and third spines, and with dark cross bars extending on the fin above the dark "saddles" on the back, definite anteriorly but becoming obscure posteriorly; base of caudal with a narrow vertical dark bar; anal everywhere with dark markings, these most distinct along the base and along the margin anteriorly; ventral slightly dusky at base; pectoral plain, except for a few dusky points.

This apparently new species is represented in the collections by a single specimen (U.S.N.M. No. 128223), 35 mm. (29 mm. to base of caudal) long, seined at Lagunilla, Independencia Bay, by the Mission.

It seems to differ from all the others of the genus in having 2 distinct tentacles, or cirri, on the upper margin of each eye. It differs from the other local species in having 14 instead of 13 rays in the pectoral, and in having a conspicuous dark spot between the second and third dorsal spines. From *E. tortugae* it differs, further, in the deeper and plumper body, and in the blunter snout, and from *E. hudsoni* in the much lower spinous dorsal, and in the much smaller ventrals.

The name *bicirrus* is in reference to the two cirri attached to the upper margin of each eye.

Range.—Known only from the type from Lagunilla, Independencia Bay, Peru.

Family DACTYLOSCOPIDAE: Sand Stargazers

Body elongate, compressed at least posteriorly; head usually large; eyes small, usually superior, placed well forward; nostrils double; mouth strongly oblique to nearly vertical; premaxillaries protractile; lips fringed; gill opening broad, the membranes separate and free from the isthmus; opercle more or less fringed; suborbital without a bony stay; dorsal fin long, divided or continuous, anteriorly with about 6 to 12 simple rays; ventral fins jugular, with a short spine and 3 articulated rays.

A single genus is included in the collections from Peru in the National Museum.

Genus MYXODAGNUS Gill, 1861

Body quite slender, the depth being contained about 7 to 10 times in the length; head long; mouth oblique; lower jaw with fleshy tip, pointed, projecting far in advance of upper jaw; eyes rather close together, lateral or directed dorsally slightly; teeth minute, pointed, present only on jaws; dorsal and anal very long, beginning nearly opposite each other, well behind margin of opercle.

This genus, which previously was known from one species, is represented in the Peruvian collections studied by a second one.

MYXODAGNUS MACROGNATHUS, new species

Figure 80

Myxodagnus opercularis Regan (not of Gill), 1913, p. 279, Lobos de Tierra, Peru, in 8 to 10 fathoms.

Head to margin of upper jaw 5.0; depth 8.6; D. 40 (or VII, 33); A. II, 37; P. 14; scales 50.

Body moderately elongate, compressed; head somewhat deeper than long, pointed, convex above; caudal peduncle rather deep, 4.3 in head; eyes nearly lateral, directed upward only slightly, 7.0 in head; interorbital space rather less then diameter of eye; mouth oblique; lower jaw with a pronounced fleshy tip, pointed, extending far in advance of mouth, entering dorsal profile; both lips fringed, those of lower lip much the larger; maxillary extending to vertical from anterior margin of pupil, 4.0 in head; teeth very small, pointed, in a narrow band anteriorly in each jaw; margin of preopercle free, broadly convex; opercle above with rather large cutaneous tentacles, the margin below the tentacles straight; gill rakers undeveloped; lateral line complete, high and arched on first 12 scales, then abruptly decurved to middle of side; scales rather large, thin, with smooth membranous borders, 4 rows between anterior part of straight portion of lateral line and base of dorsal; dorsal and anal of equal length, the origin of each fully the length of snout and eye behind margin of opercle, also approximately coterminal; caudal well separated from dorsal and anal, with a nearly straight margin, about as long as postorbital part of head; ventrals close together, inserted at vertical from preopercular margin, 3.3 in head; pectoral moderately long, reaching base of seventh ray of anal, about as long as head, 5.2 in length.

Color gray; back with a row of dark spots, one on each side of every ray, extending slightly on fin; a pale streak next to the dark spots on back, occupying roughly a row of scales; followed below by two rows of scales with dusky margins; then another pale streak on the next row of scales; straight part of lateral line in a dusky stripe; lower part of side slightly dusky; upper surface of head and nape with many irregular dark markings of unequal size, extending forward on snout and dorsal surface of lower jaw; dorsal fin plain, except for the dark spots on base already mentioned; caudal pale, with suggestions of two dusky cross bars; anal pale, with dusky spots at base, extending as dusky punctulations on fin, especially posteriorly; ventral pale; pectoral pale, with indefinite dusky markings on upper half.

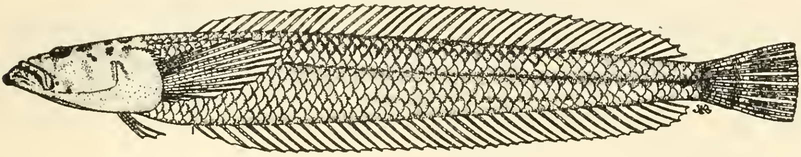

Figure 80.—*Myxodagnus macrognathus*, new species. From the type, 70 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 128224).

A single specimen (U.S.N.M. No. 128224) 70 mm. (60 mm. to base of caudal) long, is included in the Peruvian collections. This example, which was seined in Lobos de Tierra Bay by the Mission, must serve as the type of a new species. It was compared with specimens of *M. opercularis* Gill from Baja California. The principal differences are: The fewer dorsal rays in *opercularis*, 36 including simple and articulated rays in six specimens and 37 in one; the longer pectoral fin, though variable is contained 2.8 to 4.25 in length; the absence of fringes on upper lip, which has mere ridges; the slightly concave margin of the opercle; and the presence of pairs of cross lines on the back, and the virtual absence of color markings on the head.

M. opercularis has long been known from Baja California, and it was once recorded from Albemarle Island of the Galápagos group by Snodgrass and Heller (1905, p. 417). However, the authors did not state the number of fin rays or describe other apparently diagnostic characters. The color as described does not agree either with the example from Peru or with the specimens from Baja California. As the account is inadequate and the specimens are not available for examination, their identity remains uncertain.

The name *macrognathus* alludes to the long lower jaw.

Range.—Known only from Lobos de Tierra, Peru, where the type, and two small specimens reported without description by Regan (see reference above), were taken.

Family BROTULIDAE: Brotulid Eels

Body elongate, compressed, tapering regularly posteriorly; vent near middle of body; gill openings large, the membranes separate and free from the isthmus; teeth more or less pointed, in bands in the jaws, and usually on vomer and palatines; scales, if present, small, cycloid, often more or less embedded; dorsal beginning near nape; caudal continuous with dorsal and anal; ventral reduced to one or two rays, inserted somewhat in advance of pectoral.

Most of the members of this family live in the deep sea, though a few are found along the shores. A single genus is known from Peru.

Genus BROTULA Cuvier, 1829

Body quite elongate; eye moderately large; mouth rather large; small, pointed teeth in bands on jaws, vomer, and palatines; snout and mandible each with six barbels; branchiostegals eight; dorsal fin beginning somewhat behind base of pectoral; caudal fully continuous with the dorsal and anal; ventral reduced to a single, sometimes bifid distally, filament.

A single species is known from Peru.

BROTULA CLARKAE Hubbs

CONGRIO

FIGURE 81

Brotula maculata EVERMANN and RADCLIFFE, 1917, p. 151, pl. 13, fig. 3, Paita, Peru (original description).

Brotula clarkae HUBBS, 1944, p. 167 (*B. maculata* Evermann and Radcliffe found to be a homonym of *B. maculata* Day, 1868; species renamed *B. clarkae*, with type from Baja California).

Head 4.6 in total length; depth 6.25; D. 104; A. 83; P. 25; scales about 220 (too small and irregularly placed for accurate enumeration).

Body very elongate, compressed; head long, compressed, its width at margin of preopercle 2.2 in its length; snout moderately blunt, 4.5 in head; eye elongate, 5.5; interorbital 6.7; mouth large, nearly horizontal; lower jaw projecting slightly; maxillary broad, its greatest width about equal to longest diameter of eye, reaching half diameter of eye beyond orbit, 2.0 in head; minute teeth in bands on jaws, vomer, and palatines; membrane of opercle above continuous with a narrow flap extending downward on the shoulder girdle to base of pectoral; three gill rakers developed on lower limb of first arch, and none on upper limb; four small barbels on margin of snout, one behind anterior nostril, six on rami of lower jaw, the longest ones about equal in length to greatest diameter of eye; lateral line disappearing on distal part of tail; scales very small, strongly striate, imbricated, extending forward on snout and on the fins; dorsal very long, low, its origin rather less than an eye's diameter behind base of uppermost ray of pectoral, the longest rays about as long as snout and half the eye; caudal fully continuous with dorsal and anal, slightly pointed; anal similar to dorsal, though much shorter, distance from its origin to tip of snout 2.2 in total length; ventrals filamentous, inserted close together and a little in advance of margin of preopercle, the filament bifid only for a short distance distally, 2.15 in head; pectoral broadly rounded, reaching about halfway to origin of anal, 1.9 in head.

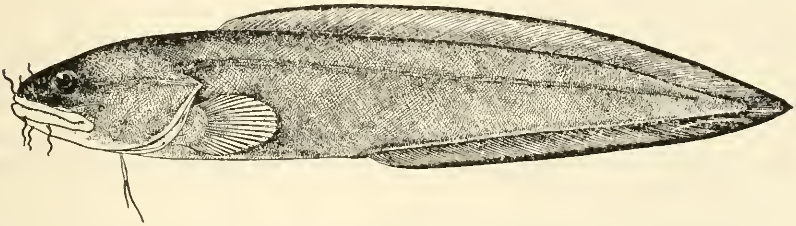

FIGURE 81.—*Brotula clarkae* Hubbs. From the type of *B. maculata* Evermann and Radcliffe, 440 mm. long, Paita, Peru (U.S.N.M. No. 77702). (After Evermann and Radcliffe, 1917.)

The color is described by Evermann and Radcliffe (see reference above) as "dusky olive with a brownish tint on back; several rows of very obscure round brownish spots on body, most distinct on tail, almost imperceptible when the fish is dry; fins body color; dorsal narrowly margined with gray; anal rather broadly margined with purplish black shading into body color." The color of the specimen described is now uniform grayish brown, except for the dark margin of the anal and of the posterior part of the dorsal.

The description is based on the type of *B. maculata* Evermann and Radcliffe (U.S.N.M. No. 77702) and only specimen at hand, which was taken at Paita by R. E. Coker and which according to my measurements is now 433 mm. long.

Although the Mission supplied no specimens, it is "assumed" in the report (1943, p. 286) that at least a part of the catch of "congrio" made in northern Peru consisted of this species.

Range.—Known only from Paita, Peru.

Family OPHIDIIDAE: Cusk Eels

Body elongate, more or less eel-shaped; head long; lower jaw included; premaxillaries protractile; both jaws, and usually vomer and palatines with pointed teeth; gill openings large, the membranes narrowly joined to isthmus behind ventrals; gills four, a slit behind the fourth; scales small, covering body and occasionally the head, sometimes embedded; dorsal and anal fins low, confluent with the caudal; ventral fins inserted between the rami of lower jaw, reduced to two barbellike filaments.

A single genus is represented in the Peruvian collections studied.

Genus GENYPTERUS Philippi, 1857

Body elongate, compressed; snout without a spine, but with a bilobed, membranous flap at tip; eyes moderately large; mouth large; outer teeth in jaws, most of those on vomer, and the single series on palatines strong; branchiostegals seven or eight; opercle with a concealed spine; lateral line present at least anteriorly; scales extending forward over most of head, embedded, not imbricated; dorsal and anal confluent with the caudal.

Two species are known from Peru.

KEY TO THE SPECIES

a. Dorsal with 150 to 155 rays[28]; anal with 112; color dark brown, pale underneath; back and sides with small, irregularly shaped and arranged pale markings ---------- **chilensis** (p. 412)

aa. Dorsal with 125 rays; anal 93 to 96; color brown, with large, hieroglyphiclike pale markings ---------- **maculatus** (p. 414)

GENYPTERUS CHILENSIS (Guichenot)

CONGRIO COLORADO

Conger chilensis GUICHENOT, *in* Gay, 1848, p. 339, Chile (original description).

Genypterus blacodes STEINDACHNER (not of Bloch and Schneider), 1902, p. 134, Callao, Peru, and Caldera, Chile (brief description).—EVERMANN and RADCLIFFE (not of Bloch and Schneider), 1917, p. 149, Mollendo, Peru (synonymy; description).

Genypterus chilensis NICHOLS and MURPHY, 1922, p. 513, North Chincha Island.—NORMAN, 1937, p. 113, Concepción and Valparaiso, Chile (synonymy; description; range).

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[28] Owing to the thickness of the skin and the slenderness of the rays, a satisfactory enumeration cannot be made without cutting the skin along the base of the fins in the species of this genus.

Head 5.25 in total length; depth 7.25, 7.55; D. 150[29]; A. 112; P. 24, 25.

Body elongate, somewhat eellike, compressed; head long, rather low, compressed, its width at margin of preopercle 1.9, 2.2 in its length; snout tapering, 3.9, 4.1 in head; eye elongate, 1.45, 1.6; interorbital 6.5, 6.25; mouth large, nearly horizontal; upper jaw projecting; maxillary broad, its width slightly exceeding longest diameter of eye, reaching two-thirds diameter of eye beyond orbit, 2.0, 2.1 in head; teeth conical or pointed, an enlarged outer series in each jaw, but those of lower jaw the larger, followed by a narrow band of minute teeth; teeth on vomer and palatines similar to the enlarged outer series of teeth in jaws, mostly in a single irregular series; membrane of opercle above continuous with a narrow flap extending downward on shoulder girdle to base of pectoral; four gill rakers developed on lower limb of first arch, none on upper; lateral line high, absent on distal part of tail; scales embedded, elongate, strongly striate; dorsal very long, low, covered with rather thick skin, the rays not clearly visible through the skin, its origin about an eye's diameter behind base of uppermost ray of pectoral, its longest rays not much longer than snout; caudal fully continuous with dorsal and anal, its margin rather broadly convex; anal similar to dorsal, though notably shorter, distance from its origin to tip of snout 2.4, 2.4 in total length; ventrals close together, inserted at vertical from anterior margin of eye, the two filaments deeply cleft, but not to base, the inner (or posterior) one the longer, 2.3, 2.1 in head; pectoral rather large, with rounded margin, 1.2, 1.8 in head.

Color dark brown above, pale underneath; back and sides behind beginning of dorsal with irregular, small, pale markings; ventral fins pale; the other fins quite dark, with very narrow pale margins. The color in life is described by Evermann and Radcliffe (see reference above) as follows: "Color in life, ventral aspect of head and abdomen light, unevenly washed with salmon; upper and lower lips deep salmon; the salmon-color of ventral surface extending backward along the base of anal fin; body dark chocolate brown, darkest above, with a few light spots, irregular in form and disposition; these spots smaller, more irregular in form and distribution and more sharply contrasted with the darker ground color, than those of the common congrio (*G. chilensis* [=*maculatus*])." M. J. Lobell, of the Mission, described the color in his field notes as "salmon colored below, brown above."

A specimen preserved by the Mission, 545 mm. long, caught at Atico Point, and one taken by R. E. Coker at Mollendo, listed as *G. blacodes* by Evermann and Radcliffe, form the basis for the description offered. In addition, a small specimen, 145 mm. long, from Tortuga

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[29] The number of dorsal and anal rays given is exclusive of the caudal rays, which are finer and closer together than the adjoining ones. The rays can be counted accurately only after cutting the skin.

Bay, is included in the collection furnished by the Mission, which according to the number of dorsal and anal rays also belongs to this species. However, it is plain gray in color, and the dorsal and anal fins have dark, instead of light margins. The following proportions and enumerations are based on this small "congrio": Head 5.8 in total length; depth 7.25; distance from tip of snout to origin of anal 2.8. Eye 3.75 in head; snout 4.5; interorbital 8.3; maxillary 2.15; width of head at margin of preopercle 2.1; ventral 1.8; pectoral 2.0. D. 115; A. 112; gill rakers on lower limb of first arch 4.

According to the report of the Mission (1943, p. 286) this species (or perhaps *G. maculatus*) reaches a length of about 500 mm. and is highly esteemed as a food fish. Rather large catches, presumably consisting of the two species of this genus recognized, and of the species of *Brotula*, recorded herein, which is also known as "congrio," have been reported. The fish are said to be caught almost exclusively with trawl lines and to prefer muddy bottom in water 20 to 50 fathoms deep.

Peruvian examples have been identified by some authors with New Zealand and Australian specimens as *G. blacodes* (Bloch and Schneider). However, Norman (1937, p. 112) identified specimens from the east coast of South America with that species and regarded the examples from the west coast as specifically distinct. As Norman had specimens from both coasts of South America, and from Australia and New Zealand for comparison, his classification has been followed herein.

Range.—Coasts of Peru and Chile.

GENYPTERUS MACULATUS (Tschudi)

CONGRIO; CHACHA

Ophidium maculatum TSCHUDI, 1845, p. 29, pl. 5, Peru (original description).

Genypterus chilensis EVERMANN and RADCLIFFE (not of Guichenot), 1917, p. 150, Guañape North Island, Pisco, and Mollendo, Peru (synonymy; description; discussion of relationship of this species and "*G. blacodes*").

Genypterus maculatus NORMAN, 1937, p. 113, Chile (synonymy; description; range; discussion of relationship of species).

Head 4.0 to 4.4 in total length; depth 5.4 to 7.9; distance from snout to origin of anal 1.9 to 2.2. Eye 7.3 to 9.6 in head; snout 4.3 to 4.75; interorbital 5.7 to 6.8; maxillary 2.26 to 2.33; postorbital part of head 1.5 to 1.55; width of head at margin of preopercle 8.5 to 10.7 ventral 2.2 to 2.4; pectoral 1.8 to 2.0. D. 125, 125; A. 93, 96; P. 25, 25 (rays counted in only two specimens); gill rakers on lower limb of first arch 4.

Color of old specimens brownish, with large light blotches of various shapes; fins, exclusive of ventrals, darker than the body. The following description is after Evermann and Radcliffe (see reference above): "Color in life, general color light chocolate-brown, with very conspicuous heiroglyphic-like white markings over entire body; while these are somewhat irregular in form and arrangement, they are still very characteristic in appearance, are evenly distributed, and tend to certain forms, as circles, oblongs, horseshoes, hourglasses, etc. These may be entirely of a light color or with brown centers."

This species is so similar to *G. chilensis*, except for color, that it does not seem profitable to give a detailed description. Indeed, it has been stated that they differ little in structure. However, when the skin was cut at the bases of the dorsal and anal fins in a few specimens, making the rays visible, a relatively great difference in the number of rays was found, as shown by the enumerations given elsewhere. Evermann and Radcliffe (see reference above) said: "A comparison of the measurements of our specimens and those given by Delfin seems to indicate that the head is a little longer, the average length of the maxillary and diameter of the eye less and the width of the interorbital greater in this species than in *G. blacodes*" (=*chilensis*). My measurements are in agreement with this statement only as to the maxillary. According to the specimens before me the outer series of teeth in the lower jaw are larger than those in the upper in *chilensis*, whereas these teeth are about equal in size in *maculatus*. Furthermore, the small teeth behind the enlarged ones of the outer series are in a narrow band in each jaw in *chilensis*, whereas they are in a very narrow band anteriorly in the upper jaw, and in one or irregularly in two series in the lower jaw in *maculatus*.

Four specimens, 355 to 660 mm. long, collected by R. E. Coker at Guañape North Island and Mollendo were studied. Evermann and Radcliffe (see reference above) referred to this species as "the common congrio." No mention is made in the report of the Mission (1943, p. 286), of the relative abundance of the two species recognized. The largest specimen at hand, which is now 660 mm. long, somewhat exceeds the maximum length of 500 mm. given in the report of the Mission. The edible qualities, the preferred habitat, and method of catching mentioned under *G. chilensis* presumably apply to both species.

As shown by the synonymy given above, this species was recognized as *G. chilensis* by Evermann and Radcliffe. However, Norman (see reference above) has produced rather convincing evidence indicating that it is *G. maculatus* (Tschudi).

Range.—Coasts of Peru and Chile.

Family STROMATEIDAE: Fiatolas

Body compressed, ovate to elongate; anterior profile generally quite blunt and rounded; mouth rather small; premaxillaries usually not protractile; teeth in jaws small in a single series, generally wanting on palatines; esophagus with lateral sacs, bearing teeth internally; gills four, a slit behind the fourth; lateral line well developed; scales small; dorsal fin long, with a few weak spines, often obsolete; anal with three or more spines, the fin sometimes as long as second dorsal; ventral fins inserted below or somewhat behind pectorals, with one spine and five soft rays in young, often reduced or obsolete in adults.

KEY TO THE GENERA

a. Ventral fins absent in adults; gill membranes united; anal with about 32 to 40 rays---------------------------------------**Stromateus** (p. 416)

aa. Ventral fins not disappearing with age; gill membranes not united; anal with about 16 to 27 rays---------------------------------**Leirus** (p. 417)

Genus STROMATEUS Linnaeus, 1758

Body ovate, compressed; mouth small; premaxillaries not protractile; maxillary not hidden by preorbital; palatine teeth wanting; opercular bones entire or minutely denticulate; gill membranes united, free from the isthmus; pseudobranchiae present; gill rakers of moderate length; branchiostegals 6; dorsal and anal fins long, the spines of dorsal feeble, graduated; caudal forked; ventrals thoracic, absent in adults; pelvis not projecting as a spine; vertebrae about 46 (modified after Regan, 1902, p. 203).

STROMATEUS MACULATUS Cuvier and Valenciennes

Stromateus maculatus CUVIER and VALENCIENNES, 1833, p. 399, Valparaiso, Chile; also reported from Lima, Peru (original description).—REGAN, 1902, p. 204 (description; reported from "Pacific coast of S. America").

"Depth of body 2½ times in total length, length of head 4½ times. Snout longer than the eye, the diameter of which is 5 times in the length of the head, interorbital width 3 times. Maxillary not extending to below the eye. D. VII 40–43, the rays increasing in length to the tenth soft ray, which is half the length of head. A. III 38. Pectoral longer than the head. Caudal lobes as long as the head. Gill-rakers less than ⅓ the eye-diameter, 12 on lower part of the anterior arch. Blue above, silvery below; numerous round dark spots on the upper half of the body. Total length, 200 millim." (Regan, 1902, p. 204).

This species has not been taken in Peru by recent collectors. I have seen no specimens.

Range.—"Pacific Coast of S. America" (Regan). Originally described from Valparaiso, Chile, and reported as common in the market at Lima, Peru, from May to July, by Cuvier and Valenciennes (see reference above). A specimen from "Rio Grande do Sul, South

America" was described as this species (Fordice, 1884, p. 314). Steindachner (1898, p. 299) reported two examples from Puerto Montt, Chile.

Genus LEIRUS Lowe, 1834

Body more or less ovate, compressed; mouth small or moderate; premaxillaries slightly protractile; maxillary not slipping entirely under preorbital, with a small supplemental bone; teeth wanting on palatines; preopercle generally spinate, subopercle and interopercle denticulate; gill membranes not united; gill rakers long; pseudobranchiae present; lateral line curved anteriorly, becoming straight anterior to caudal peduncle; scale small; dorsal with 4 to 9 spines; anal with 3 spines; caudal forked or emarginate; vertebrae about 25. (Modified after Regan, 1902, p. 196.)

A single species has been reported from Peru.[30]

LEIRUS PERUANUS (Steindachner)

Centrolophus peruanus STEINDACHNER, 1874, p. 10, Callao, Peru (original description).

Lirus peruanus REGAN, 1902, p. 200, Peru (description, apparently modified after Steindachner).

Head about 3.0; depth 3.2; D. VIII or IX–26 to 28; A. III, 18; P. 22; scales about 80 to 90.

Snout about 3.8 to 4.0 in head; eye about 5.0; interorbital about 3.0 to 3.4; angle of mouth under anterior margin of eye; each jaw with a single row of small, numerous teeth, none on vomer and palatines; the short rather soft spines of the dorsal increasing in length to the eighth or ninth; the longest rays of dorsal contained in head about 2.5 to 3.0 times; caudal deeply lunate, the lobes nearly as long as head; first anal spine very short, the third scarcely half as long as snout, longest ray about a third length of head; ventral rather small, inserted behind pectoral, attached to abdomen by a membrane; pectoral very long, falcate, nearly or quite as long as head.

Upper part of head, the back to the lateral line, the dorsal, caudal, and adjacent parts of peduncle, the inner side of pectoral, and the free part of shoulder girdle smoke gray or dark violet; the rest of body golden yellow, and like the ventral and anal, usually sprinkled with very small violet points. (Description condensed from Steindachner.)

This species has not been taken in Peru by recent collectors. I have not seen specimens. It apparently is known from Peru only from the type material taken by Steindachner, who found it in *abundance* in the market at Callao in May 1872. That investigator stated that according to the fishermen this fish lives in relatively deep water, where it is caught with hooks. Steindachner (1898, p. 299) later reported this species from Iquique, Chile, from a specimen 370 mm.

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[30] The partly digested specimen mentioned in the footnote on page 418 may represent a second species.

long, for which he gave the following proportions and enumerations; head in length about 3.15; depth 3.15. D. VII–I, 24; A. III. 20; P. 21; scales 90.[31]

Range.—Callao, Peru, to Iquique, Chile.

Family SPHYRAENIDAE: Barracudas

Body very elongate, little compressed; head long, pointed, pikelike; mouth large, nearly horizontal, with the rather pointed mandible strongly projecting, the edges formed by nonprotractile premaxillaries and the rather broad maxillaries posteriorly; mouth provided with large sharp teeth of unequal size; opercular bones without spines or serrations; gills four, the rakers short or obsolete; scales moderate or small, cycloid, present on cheeks and opercles, and usually on part of upper surface of head; lateral line well developed, straight, first dorsal with five spines, the second fin remote, with one or two flexible spines and about seven to nine soft rays; anal similar to second dorsal and more or less opposite it; caudal fin forked; ventral fins abdominal, with one spine and five soft rays; pectoral fins short, inserted at or below midline of side.

Genus SPHYRAENA Klein, 1778

The characters of the genus are sufficiently indicated in the family description.

A single species comes within the scope of the present work.

SPHYRAENA IDIASTES Heller and Snodgrass

Picuda; Aguja

Sphyraena idiastes Heller and Snodgrass, 1903, p. 190, pl. 2, Seymour Island, Galápagos Archipelago (original description).—Evermann and Radcliffe, 1917, p. 51, Guañape North Island, Lobos de Tierra, Peru (description).—Nichols and Murphy, 1922, p. 506, Lobos de Tierra Island, Peru.

Head 3.2, 3.35; depth 7.6, 7.0 or 2.4, 2.05 in head; D. V–I, 8, V–I, 8; A. II, 9, II, 8; P. 13, 13; scales 146, 150.

Body very elongate, somewhat compressed, the depth exceeding width at base of ventrals by about diameter of eye; caudal peduncle compressed, its depth 5.5, 5.0 in head; head rather low, convex above, without prominent ridges; snout long, broadly rounded anteriorly, 2.3, 2.35 in head; eye 6.9, 7.6; interorbital 6.25, 6.6; mouth large, narrow, the long slender pointed mandible projecting by about half diameter of eye; maxillary broad, failing to reach eye, 2.65, 2.6 in head; teeth on premaxillaries very small, pointed, missing anteriorly; two pairs of large strong compressed pointed teeth on inner premaxillaries, followed by a series of similar teeth, unequal in size, on the palatines; a single large compressed tooth, median in position, on lower jaw anteriorly, and a series of much smaller compressed teeth laterally; scales small, those in lateral line slightly enlarged, with raised pores; dorsal fins far apart, the origin of the first a little nearer the second than the eye, origin of the second a little nearer base of caudal than the origin of the first; caudal fin deeply forked, the upper lobe slightly the longer; anal similar to second dorsal, elevated anteriorly, the last ray somewhat produced, its origin under or slightly behind that of second dorsal, its base 4.0, 4.1 in head; ventral only a little shorter than pectoral, inserted under origin of first dorsal, and equidistant from origin of anal and some point over the eye; pectoral somewhat pointed 3.0, 3.1 in head.

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[31] After the foregoing account had been prepared a specimen 70 mm. (53 mm. to base of caudal) long, removed from the stomach of an "atún" (*Thunnus macropterus*), was identified as of this genus. The atún was caught by trolling off Salaverry, at lat. 8°10′ S., long. 80°05′ W. The specimen is in disagreement in several respects with the descriptions of *L. peruanus*, but its condition is such that an accurate description cannot be prepared, as the scales are missing, the skin is partly digested away, and the fins are mostly in a very imperfect condition. Steindachner (1874, p. 10) stated that the ventral fins are inserted behind the pectorals in *L. peruanus*, and are little developed. In the specimen before me they are inserted under and slightly in advance of the pectorals, and are quite long, reaching well beyond the origin of the anal. The specimens described by Steindachner, which were taken in the market, presumably were large ones. It is not improbable that the ventral fins decrease in length with age in this group of fishes. However, their relative position would be expected to remain the same. The anal rays apparently are more numerous, and the pectoral rays are fewer. Furthermore, Steindachner stated that a single row of many minute teeth was present on the margins of the jaws. In the specimen at hand the teeth in the lower jaw are larger, more numerous, and consequently closer together than those in the upper jaw.

The following proportions and eumerations are based on the small specimen in hand: Head 2.95 in length; depth 3.1; base of anal 2.5; pectoral 3.8. Eye 3.0 in head; snout 5.1; interorbital 5.0, maxillary 3.0; caudal peduncle 5.6; ventral 1.4; pectoral 1.25. D. XI–1, 25; A. III, 26; P. 19; V. I, 5; gill rakers 7+14.

Color uniform brownish gray above; silvery below about middle of side; ventrals and pectorals mostly pale; other fins largely dusky.

The foregoing description is based on 2 specimens, 540 and 575 mm. (440 and 488 mm. from tip of upper jaw to base of caudal) long. The proportions and enumerations given first pertain to the smaller specimens. In addition, there are at hand 13 small specimens, 65 to 153 mm. (57 to 122 mm. from tip of upper jaw to base of caudal) long. The young are somewhat slenderer than the adults, though on the whole not differing greatly, except in color. The smallest specimens have 6 large dark spots on the back, with narrow cross bars between the posterior blotches, and 3 on the ventral surface, the first one being under the anal base. The blotches have become obscure in specimens 110 mm. long, and no trace of them is evident in the next larger specimen, which is 153 mm. long. The following proportions and enumerations are based on 6 of the small specimens, 65 to 153 mm. (57 to 122 mm. from tip of upper jaw to base of caudal) long: Head in length 2.8 to 3.1; depth 8.2 to 9.7 or 2.8 to 3.3 in head. Eye in head 4.75 to 5.6; snout 2.0 to 2.4; interorbital 7.0 to 7.6; maxillary 2.25 to 2.4; caudal peduncle 6.3 to 7.2; anal base 3.3 to 4.5; ventral 3.2 to 4.0; pectoral 3.2 to 3.4. D. V–I, 8 or 9; A. II, 8 or 9; P. 12 or 13; scales, in lateral line, 130 to 140.

The Mission secured specimens in the Gulf of Guayaquil, off Puerto Pizarro, in Lobos de Afuera Bay, and at Pachacamac Island. One of the larger specimens at hand was taken by R. E. Coker at Guañape

North Island. The species is characterized chiefly by the small scales, posterior insertion of the ventral fins, and the rather short pectoral fins.

Range.—Galápagos Island, and coast of Peru.

Family MUGILIDAE: Mullets

Body elongate, more or less compressed; mouth moderately small, with or without small teeth; premaxillaries protractile; gill openings wide, the membranes separate and free from the isthmus; gills 4, a slit behind the fourth; gill rakers long and slender; scales large; no lateral line; two short, well-separated dorsal fins, the first with four stiff spines; second dorsal longer than the first; anal with two or three graduated spines; caudal forked; ventrals abdominal, with one spine and five soft rays.

A single genus comes within the scope of the present work.

Genus MUGIL Linnaeus, 1758

Head large, about as broad as deep in adults; eye with much adipose tissue in large examples; mouth broad, oblique; lower jaw included, angulate; teeth present on jaws only, small and flexible, often in one or a few series, occasionally in a band; scales rather large, firm, extending forward on head, and generally more or less on the fins; anal fin in young, under about 50 to 60 mm. long, with two spines, adults constantly with three; stomach with heavy muscular walls, gizzardlike. The mullets often have been described as "mud eating fish," the mud being ingested chiefly for its diatom content. The genus is of wide distribution, occurring in all warm seas. Some of the species are of great commercial value.

Five species seem to belong to the fauna of Peru.

KEY TO THE SPECIES

a. Anal normally with III, 8 (young II, 9) rays; fins, except caudal (in one species), not densely scaled, the scales on fins not increasing greatly in density with age.
  b. Teeth in each jaw in a rather broad band; mouth broad, its width at angles generally exceeding the length of maxillary______**rammelsbergii** (p. 421)
  bb. Teeth in jaws not in broad bands.
    c. Teeth in upper jaw generally in a single series, occasionally in a very narrow band; scales rather smooth, without prominent concentric rings, present on base of caudal only; mouth moderately narrow, its width generally about equal to length of maxillary _______ **cephalus** (p. 422)
    cc. Teeth in upper jaw in 2 well-separated series; scales more or less rough to the touch, with prominent concentric rings, many with serrated margins, scales covering most of the caudal fin; width of mouth equal to or slightly exceeding length of maxillary_**peruanus**, new species (p. 424)
aa. Anal normally with III, 9 (young II, 10) rays; fins, exclusive of spinous dorsal densely scaled in adults.
  d. Upper lip thin; scales 35 to 40________________________**curema** (p. 426)
  dd. Upper lip thick; scales 45 or 46______________________**thoburni** (p. 428)

MUGIL RAMMELSBERGII Tschudi

Liza

Mugil rammelsbergii Tschudi, 1845, p. 20, San Lorenzo Island, Peru (original description; abundant in May and October. The anal formula is given as II, 8 for fish 10 to 12 inches long, the first spine, which is small, probably having been overlooked. The teeth were described as very numerous).

Head 3.7 to 4.0; depth 3.85 to 4.4; D. IV–I, 8; A. III, 8; P. 15 or 16; scales 40 to 44, 10 or 11 complete rows between bases of second dorsal and anal.

Body anteriorly somewhat compressed; caudal peduncle rather strongly compressed, 2.5 to 2.9 in head; head convex above, fully as broad as deep; snout broad, 3.8 to 4.0 in head; eye 4.5 to 5.5; interorbital 2.3 to 2.4; mouth oblique, lower jaw included; maxillary barely reaching front of eye, somewhat shorter than width of mouth, 3.7 to 3.85 in head; teeth in upper jaw (premaxillaries) in a rather broad band, partly bifid, those of lower jaw also in a broad band on the inner rounded surface of the somewhat thickened lower jaw, and similar to those in upper jaw; preorbital bone weakly serrate; scales on body not rough to the touch, without prominent concentric rings (except the modified ones on head), mostly with finely serrated margins, extending more or less on all the fins exclusive of spinous dorsal, present only on anterior rays of second dorsal and anal; gill rakers slender, becoming very small anteriorly, about 60 on lower limb of first arch in a specimen 240 mm. long; first dorsal origin equidistant from tip of snout and base of caudal, or a little nearer the snout; second dorsal origin a little behind that of anal, about an eye's diameter nearer origin of first dorsal than base of caudal; anal similar to second dorsal, its base 7.8 to 8.5 in length; ventral inserted about equidistant from tip of snout and middle of anal base; pectoral somewhat pointed, reaching well beyond base of ventral, 1.4 to 1.6 in head.

Color of preserved specimens bluish gray above; silvery below about middle of side; middle portion of side with many brown points; rows of scales on this part of body with rather prominent dark streaks; ventral fins pale; all other fins more or less dusky; the margin of anal and its last two or three rays pale; pectoral black at base of upper rays, distally black, with a narrow pale margin, its inner surface almost wholly black.

The foregoing description is based on four specimens, 240 to 425 mm. (195 to 350 mm. to base of caudal) long. Three of these were obtained by the Mission at Lobos de Tierra Island, and one was obtained by the Wilkes Expedition at Callao. Many smaller specimens were collected by the Mission at La Lagunilla, which were included in the large variable lot mentioned in the account of *M. cephalus*.

The following proportions and enumerations are based on eight specimens 56 to 115 mm. (44 to 90 mm. to base of caudal) long, from La Lagunilla, which definitely have bands of teeth on both jaws: Head in length 3.1 to 3.35; depth 3.39 to 3.4; base of anal 7.2 to 9.0; pectoral 5.1 to 5.9. Eye in head 4.0 to 4.8; snout 4.2 to 5.0; maxillary 4.2 to 5.0; interorbital 3.0 to 3.6; caudal peduncle 2.9 to 3.5; anal base 2.2 to 2.8; pectoral 1.6 to 1.8; D. IV–I, 8; A. III, 8; P. 16; scales 40 to 44; vertebrae 23 or 24 (3 specimens dissected); gill rakers 31 in a specimen 56 mm. long, 37 in one 86 mm. long, and 42 in another one 110 mm. long (60 in a specimen 240 mm. long), evidently increasing in number with age.

The specimens herein identified as *M. rammelsbergii* differ from those identified as *M. cephalus* chiefly in having a broad band of teeth in each jaw instead of having the teeth chiefly in a single row; the lower jaw is rather thicker and the inner surface is convex instead of flat; and the mouth is wider, the maxillary measured in a straight line from a median point on snout to its extremity being shorter than width of mouth at its angles, whereas in *M. cephalus* it is about equal to the width of the mouth. The difference in the width of the mouth, although quite evident in the large examples at hand, becomes obscure in the smaller ones. Then, as stated elsewhere, several small specimens I am unable to place with certainty in either species. It seems possible, therefore, that intergradation occurs. However, I have examined quite a number of specimens of *M. cephalus* of various sizes from other American localities, especially Chesapeake Bay and Beaufort, N. C., without finding any with a band of teeth on the lower jaw.

The chief reason for using the name *rammelsbergii*, which has long rested in the synonymy of *M. cephalus*, is the statement in the original description, "Die Zahne sehr zalreich, aber fein." The teeth, although fine in *M. cephalus*, can scarcely be defined as "very numerous."

Range.—Coast of Peru and nearby islands. To date known only from latitude 6°56′ to 14°13′ S.

MUGIL CEPHALUS Linnaeus

LIZA

Mugil cephalus LINNAEUS, 1758, p. 316, Europe (diagnosis, based on Artedi, pre-Linnean).—ABBOTT, 1899, p. 343, Callao, Peru (notes; description of *M. rammelsbergii* Tschudi quoted in full. *M. rammelsbergii* herein is recognized as distinct from *M. cephalus*).—REGAN, 1913, p. 279, Pacasmayo, Peru.—EVERMANN and RADCLIFFE (in part not of Linnaeus), 1917, p. 49, Callao, Ancon, Arequipa (market), Río de Eten (near Eten), Río Rimac (below Lima), and Pacasmayo, Peru (description; locally abundant).—NICHOLS and MURPHY, 1922, p. 506, south of Paracas Peninsula, Peru.—MEEK and HILDEBRAND, 1923, p. 275 (synonymy; description; range).

?*Querimana harengus* REGAN, 1913, p. 279, Pacasmayo, Peru (young).

Head 3.65 to 4.0; depth 3.9 to 4.45; D. IV—I, 8; A. III, 8; P. 15 or 16; scales 41 to 44, 10 or 11 through series between bases of second dorsal and anal.

Body somewhat compressed; caudal peduncle rather strongly compressed, its depth 2.8 to 3.0 in head; head convex above, rather broader than deep; snout broad, 3.5 to 3.9 in head; eye 5.3 to 6.0; interorbital 2.3 to 2.5; mouth oblique, lower jaw included; maxillary reaching front of eye, about equal to width of mouth, 3.5 to 3.8 in head; teeth in upper jaw (premaxillaries) in an irregular series, or very narrow band at edge of jaw, some of the teeth slightly bifid, those on lower jaw in a labial series, followed occasionally by a few extremely minute ones on the flat inner surface of the jaw; preorbital bone weakly serrate; scales on body not rough to the touch, without prominent concentric rings (except those on head) mostly with finely serrated edges, extending more or less on all the fins exclusive of the spinous dorsal, present only on a few of the anterior rays of the second dorsal and anal; gill rakers slender, becoming very short anteriorly, about 73 on lower limb of first arch in a specimen 375 mm. long; first dorsal origin slightly nearer tip of snout than base of caudal; second dorsal origin a little behind that of anal, about an eye's diameter nearer origin of first dorsal than base of caudal; anal about same shape and size as dorsal, its base 8.5 to 9.0 in length; ventral inserted about equidistant from tip of snout and middle of anal base; pectoral rather pointed, reaching well beyond base of ventral, 1.6 to 1.7 in head.

Color of preserved specimens bluish brown above; silvery below about middle of side; middle portion of side with many brown points; rows of scales on this part of body with rather prominent dark streaks; ventral fins pale; all other fins more or less dusky; the margin of anal and its last two or three rays pale; pectoral black at base of upper rays, distally black, with a narrow pale margin, its inner surface almost wholly black.

The foregoing description is based on four large specimens, ranging in length from 285 to 510 mm. (230 to 421 mm. to base of caudal). Three of these were taken by the Mission at Lobos de Tierra Island and in Chilca Bay, and the fourth specimen was secured by R. E. Coker at Callao. Numerous smaller specimens were collected by the Mission in Tortuga Bay and at La Lagunilla. The specimens from the last-mentioned locality are very variable as to the shape of the lower jaw and as to the teeth. Some of them clearly agree with the large specimens described above; others agree with those described herein as *M. rammelsbergii;* and a few are more or less intermediate. The young of about 30 to 45 mm. in total length in the collection either all belong to this species or are not separable because the distinguishing characters are undeveloped.

The following proportions and enumerations are based on 11 specimens (unless otherwise stated), ranging from 70 to 150 mm. (54 to 119 mm. to base of caudal) in length, which according to the dentition clearly agree with the large specimens described: Head in length 3.2 to 3.6; depth 3.5 to 4.0; base of anal 7.3 to 8.3; pectoral 5.3 to 6.0. Eye in head 4.0 to 5.0; snout 4.25 to 5.0; maxillary 4.0 to 4.4; interorbital 3.0 to 3.4; caudal peduncle 2.7 to 3.1; anal base 2.1 to 2.5; pectoral 1.6 to 1.75. D. IV–I, 8; A. III, 8; P. 15 or 16; scales 39 to 43; vertebrae 23 (two specimens dissected); gill rakers 40 in a specimen 88 mm. long, 50 in a specimen 145 mm. long (73 in a specimen 375 mm. long, as shown in description above), evidently increasing in number with age.

It is stated in the report of the Mission (1943, p. 281) that "liza" is a highly important fish in Peru, and the authors believed that virtually the entire catch consists of *M. cephalus.* "Landings were made from Puerto Pizarro in the north to Ilo in the south, with the bulk of them reported from Callao and Pisco."

Range.—Shores of nearly all warm seas. On the Atlantic coast of America from Cape Cod to Brazil and on the Pacific coast from California to Chile.

MUGIL PERUANUS, new species

LIZA

FIGURE 82

Mugil cephalus EVERMANN and RADCLIFFE, 1917, p. 49 (in part this species), Callao and Pacasmayo, Peru.

Head 2.9 to 3.4; depth 3.1 to 3.7; D. IV–I, 8; A. III, 8 (II, 9 in young less than about 55 mm. long); P. 15 or 16; scales 39 to 42, generally with 10 through series between bases of second dorsal and anal; vertebrae 24 (two specimens dissected).

Body fairly compressed; ventral outline somewhat more strongly convex than the dorsal; caudal peduncle rather strongly compressed, its depth 2.8 to 3.4 in head; head convex above, deeper than broad; snout moderately long, 4.6 to 5.5 in head; eye 3.6 to 4.8, adipose tissue developed only in largest specimen (95 mm. long) at hand; interorbital 3.1 to 3.6; mouth rather strongly oblique; lower jaw included, rather strongly angulate; maxillary scarcely reaching front of eye, 3.9 to 4.5 in head; teeth in upper jaw (premaxillary) principally in 2 well-separated series, sometimes with a few scattered ones between these rows, those of lower jaw in a single labial series, all teeth apparently simple, the outer ones curved inward; preorbital bone weakly serrate; scales on body and head rather hard, more or less rough to the touch, with prominent concentric rings, many on body with serrate margins, the spinelike processes extending on the surface of the scales; scales developed early on gill covers, being at least indefinitely present on opercle even in the smallest specimens (35 mm. long) at hand; scales extending on all the fins, exclusive of spinous dorsal, covering most of the caudal; gill rakers slender, 30 on lower limb of first arch in a specimen 50 mm. long; origin of first dorsal generally somewhat nearer base of caudal than tip of snout; origin of second dorsal a little behind that of anal, and a little nearer origin of first dorsal than base of caudal; anal similar to second dorsal, its base a little longer, 7.7 to 8.5 in length; ventral inserted equidistant from tip of snout and end of anal base or a little nearer the latter; pectoral short, though extending well beyond base of ventral, 1.75 to 2.0 in head.

Color of preserved specimens dark gray above, pale to brownish underneath. Lower parts probably more or less silvery in life, but the five lots, consisting of more than 100 specimens, collected at different times and in different places, are without a silvery sheen. Upper surface of head generally with dark spots; body everywhere, except lower parts of head, chest and abdomen, with brown points; gill covers pale or brownish, translucent, the gills generally visible through the opercles; ventrals and pectorals pale, except for a dark spot at base of the upper rays of the latter; other fins more or less dusky.

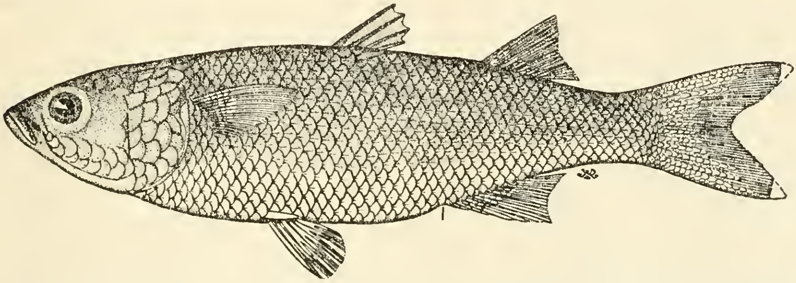

FIGURE 82.—*Mugil peruanus*, new species. From the type, 95 mm. long, Independencia Bay, Peru (U.S.N.M. No. 127877).

More than 100 specimens, 35 to 95 mm. (27 to 77 mm. to base of caudal) long, were collected by the Mission. These were taken in Sechura Bay, Samanco Bay, Tortuga Bay, Chilca Bay, at La Lagunilla, and in Independencia Bay. Most of them were seined, and some were taken under a light. The proportions and enumerations used are based on 10 specimens, exclusive of the counts of vertebrae which are based on 2 specimens, and those of anal rays on 35. The first soft ray of the anal is transformed into a spine when the fish attain a length of about 55 to 60 mm. The largest specimen, 95 mm. (77 mm. to base of caudal) long (U.S.N.M. No. 127877), taken in Independencia Bay, near La Lagunilla, has been selected as the type. The following proportions and enumerations pertain to the type: Head in length 3.33; depth 3.5; anal base 7.7; pectoral 5.9. Eye in head 4.8; snout 4.6; interorbital 3.15; maxillary 3.9; caudal peduncle 2.8; pectoral 1.75. D. IV–I, 8; A. III, 8; P. 15; scales 42.

This species is close to *M. cephalus*, from which it differs in having rough scales, which cover most of the caudal fin and seem to be developed earlier in life on the gill covers. In young *M. cephalus*, as well as in *M. curema*, the opercles are bright silvery in the young, whereas they are brownish and translucent in *M. peruanus*, the gills generally being visible through the covers. Small specimens of *M. cephalus* and *M. curema* are bright silvery, whereas those of *M. peruanus* are without a silvery sheen. In dentition it differs from the two species mentioned, as shown by the descriptions.

Two lots of small specimens collected by R. E. Coker at Callao and Pacasmayo, Peru, are also of this species. They are part of the specimens reported as *M. cephalus* by Evermann and Radcliffe (1917, p. 49).

A large lot of small specimens collected by W. L. Schmitt, in fresh water in the Río Moche, near Salaverry, Peru, is somewhat bothersome. They all come within the range of length of the specimens secured by the Mission. They have some characters in common with the specimens herein described as *peruanus*, that is, the scales are provided with prominent concentric rings and are rough to the touch, and they extend on the fins somewhat. The teeth in most of them are arranged as stated in the foregoing description, though a few have rather numerous teeth between the two main rows in the upper jaw, and some minute ones behind the labial series in the lower jaw. Furthermore, they are silvery in color, have no dark spots on the head, and have comparatively few brown points on the body. These specimens tend to form a "connecting link" between those herein described as *peruanus* and those recognized as *rammelsbergii*. It is obvious that more specimens and a much more extended study of specimens from a wider range of localities are necessary before the exact relationship of the different species, subspecies, and varieties of *Mugil* can be determined.

Range.—Coast of Peru. To date taken only between latitude 5°52′ and 14°13′ S.

MUGIL CUREMA Cuvier and Valenciennes

LIZA

Mugil curema CUVIER and VALENCIENNES, 1836, p. 87, Brazil and Martinique (original description).—MEEK and HILDEBRAND, 1923, p. 279, both coasts of Panama (synonymy; description; range).

Mugil ciliilabis CUVIER and VALENCIENNES, 1836, p. 151, "Callao de Lima," Peru (original description. It is not evident from the description wherein this supposedly new species differs from *M. curema*. The anal formula, III, 9, is correct for *curema*, and there is nothing in the description of the teeth inconsistent with those of that species. Just why *ciliilabis* was referred to the genus *Myxus*, and later to *Neomyxus*, by authors is not clear).

Head 3.8, 3.9; depth 3.9, 4.3; D. IV–I, 8; A. II, 9; P. 15.

Body fairly elongate, compressed; ventral outline a little more strongly convex than the dorsal; caudal peduncle rather strongly compressed, its depth 2.7, 3.3 in head; head convex above; snout moderate, 6.7, 7.1 in head; eye 3.8, 3.9; interorbital 4.0, 4.2; mouth oblique, the lower jaw included; maxillary reaching under anterior margin of eye, 4.0, 4.7 in head; teeth in a single, irregular, labial series in each jaw, those of the lower jaw exceedingly small; preorbital strongly serrate; opercle entirely scaleless; cheek with two rows of scales; scales on body mostly missing, those present (along back) with smooth edges and strong concentric rings; first dorsal origin a little nearer tip of snout than base of caudal; second dorsal origin a little behind that of anal and a little nearer origin of first dorsal than base of caudal; anal a little longer than second dorsal, its base 7.5, 7.75 in length; ventral inserted in advance of tip of pectoral, a little nearer tip of snout than middle of anal base; pectoral short, somewhat rounded, 2.15 in head in one specimen, damaged in the other.

Color very dark above, silvery elsewhere; gill covers brilliantly silvery, not translucent; base of caudal with a dark bar; snout and margins of lower jaw black; ventral and anal pale; other fins more or less dusky.

The foregoing description is based on two specimens, 37 and 39 mm. (30 and 31 mm. to base of caudal) long, from Mazorka Island, in the Huaura Group, the only ones obtained by the Mission. This species, although long known from Chile and from Ecuador, has previously not been recorded from Peru under this name. It is believed, however, as explained above, that *M. ciliilabis* Cuvier and Valenciennes is this species. The identification with *M. curema* of the two small specimens secured by the Mission is a bit uncertain because each specimen has only 9 soft rays in addition to 2 spines, in the anal fin, whereas the almost constant number for this species for the young is 2 spines and 10 soft rays, and for adults 3 spines and 9 soft rays. However, variations have been reported. Among 3 specimens from the Pearl Islands, Panama, now at hand, 1 specimen has 2 spines and only 9 soft rays, whereas the others have the usual number of rays.

In the young up to a length of about 85 mm. the opercles remain naked and very bright silvery, as shown by specimens from Panama and elsewhere. Thereafter they become covered with scales and lose some of the bright silvery sheen. The first soft ray of the anal is transformed into a spine at a length of about 60 mm., there being some variation among specimens. When the fish have attained a length of about 50 mm., the scales on the chest develop spines along the margins, which extend back somewhat on the surface of the scale, making the scales rough to the touch. According to a limited number of specimens examined, this ctenoidlike condition of the scales spreads to the sides of the fish in young adults, though the spines become smaller again in large specimens. Scales are present on the bases of all the fins, exclusive of the spinous dorsal, even in the smallest specimens (35 to 40 mm. long) at hand, which include the Peruvian material. As the fish grow the scales become denser and extend farther on the fins. The adults are much less bright silvery than the young herein described.

Range.—Both coasts of America; on the Pacific coast from the Gulf of California to Chile and on the Atlantic from Cape Cod to Brazil. Recorded also from Africa.

MUGIL THOBURNI Jordan and Starks

Liza

Mugil thoburni Jordan and Starks, *in* Jordan and Evermann, 1896, p. 812, Galápagos Islands (original description; compared with *M. incilis;* range).—Nichols and Murphy, 1922, p. 506, Paracas Bay, Peru.—Meek and Hildebrand, 1923, p. 278 (references; description, based on type material; range).

This species is not included in the collections from Peru now at hand. I have examined several specimens from the Galápagos Islands, which agree with *curema* in the number of anal rays and in having the fins rather densely covered with scales. However, this species differs from *curema* and all the other species herein recognized from Peru in the thick upper lip and the smaller scales, the count for the oblique series between the upper anterior angle of the opercle and base of caudal in five specimens being 45 and 46.

Range.—Guatemala to Peru and the Galápagos Islands.

Family ATHERINIDAE: Silversides

Body generally quite elongate, compressed; vertebrae more than 30; mouth moderate or small, usually with pointed teeth; gills 4; lateral line absent, or incompletely and irregularly developed; anal fin with a single spine in American species; first dorsal with 3 to 9 flexible spines in Peruvian species, rarely missing; pectoral placed high and more or less pointed in American species; ventral fins abdominal, with 1 spine and 5 soft rays.

KEY TO THE GENERA

a. Premaxillaries protractile; scales on top of head not reversed in imbrication.
  b. Head rather long and pointed, not abruptly shortened posteriorly; anal fin short, with about 14 to 16 rays---------**Austromenidia** (p. 428)
  bb. Head short, blunt, abruptly shortened posteriorly, the margin of opercle little convex; anal fin long with about 25 to 30 rays-**Eurystole** (p. 431)
aa. Premaxillaries not protractile; scales on top of head reversed in imbrication; anal fin small, with about 13 to 16 soft rays------**Basilichthys** (p. 433)

Genus AUSTROMENIDIA Hubbs, 1918

Body quite elongate; belly rouned; vertebrae numerous, about 48; head moderately low; snout rather pointed; premaxillaries protractile; teeth well developed in both jaws; scales small, extending forward on head and cheeks; first dorsal, over space between base of ventral and origin of anal, remote from second dorsal, usually with five or six spines; pectoral fin not reaching base of ventral.

AUSTROMENIDIA REGIA (Humboldt and Valenciennes)

PEJERREY

FIGURE 83

Atherina regia HUMBOLDT and VALENCIENNES, 1833, p. 187, Callao, Peru (original description).

Atherina laticlavia COPE (probably not of Cuvier and Valenciennes), 1877, p. 28, Callao Bay, Peru.

Basilichthys regillus ABBOTT, 1899, p. 339, Callao, Peru (original description).—STARKS, 1906, p. 783, Callao, Peru.

Basilichthys octavius ABBOTT, 1899, p. 340, Callao, Peru (original description, thought to be more slender, with greater space between dorsals, and with more numerous spines in first dorsal than in *B. regillus*).

Basilichthys jordani ABBOTT, 1899, p. 341, Callao, Peru (original description, thought to differ from *B. regillus* and *B. octavius* in having a more strongly developed lower jaw and in the presence of teeth on vomer).

Chirostoma affine STEINDACHNER (possibly not of Steindachner, 1898, p. 313, Iquique, Chile), 1902, p. 128, Callao, Peru (description).

Basilichthys affinis EVERMANN and RADCLIFFE, 1917, p. 47, pl. 4, fig. 3, Callao and Pisco, Peru (synonymy; description; reasons for synonymizing *B. regillus* and *B. jordani*, both of Abbott are stated).—NICHOLS and MURPHY, 1922, p. 506, Lobos de Tierra Island, Independencia Bay, North Chincha Island, and Callao, Peru.

Austromenidia regia JORDAN and HUBBS, 1919, p. 66 (synonymy; range).—FOWLER, 1940b, p. 763, Callao, Peru.

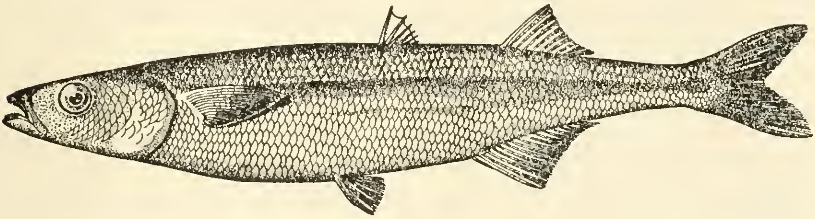

FIGURE 83.—*Austromenidia regia* (Humboldt and Valenciennes). From a specimen 270 mm. long, Callao, Peru (U.S.N.M. No. 77644). (After *Basilichthys affinis* Evermann and Radcliffe, 1917.)

Head 4.1 to 4.7; depth about 5.4 to 6.4; D. IV to VIII–I, 8 to 11; A. I, 14 to 16; P. 14 to 16 (usually 15); scales 70 to 93, 11 complete through series between basis of second dorsal and anal; vertebrae 49 to 51 (seven specimens dissected).

Body very elongate, compressed; caudal peduncle fairly slender, its depth 3.3 to 3.8 in head; head rather low, somewhat compressed, its upper profile nearly straight; snout rather long, pointed, 3.2 to 3.7 in head; eye round, 3.4 to 5.5; interorbital slightly convex, 3.4 to 3.8; mouth terminal; premaxillaries curved, protractile, being capable of considerable extension; maxillary somewhat expanded, round posteriorly, extending downward to near mandibular joint; teeth in the jaws mostly in 2 series, pointed, those on vomer and palatines present or absent, variable, their development not entirely related to age, sometimes present or absent in specimens of equal size, none observed in specimens under 130 mm. long; gill rakers slender, about three-fourths length of eye, about 7 to 9 developed on upper and 24 to 28 on lower limb of first arch; lateral line not definitely developed, but scattered scales with pores; scales small, cycloid, adherent, variable in number, longitudinal rows quite constant; first dorsal composed of very slender spines, its origin over or in advance of tips of ventrals; second dorsal slightly elevated anteriorly, with concave margin, the longest rays failing to reach the tip of the last slightly produced one, origin of fin about over middle of base of anal; anal similar to dorsal, though longer, its base 5.9 to 6.4 in length; ventral small, scarcely longer than snout in large examples, about as long as snout and half the eye in very small specimens, inserted notably nearer tip of snout than base of caudal; pectoral pointed, 5.9 to 6.5 in length, 1.3 to 1.5 in head.

Color of preserved specimens brownish above, pale below; side with a broad silvery band, sometimes dark brown (probably according to preservative used), with a dark margin above, band nearly as broad as eye in large examples, narrower in small ones; dorsal fins, caudal and pectoral with dusky points; other fins pale.

TABLE 3.—*Ferquency distribution of length of head, number of spines in first dorsal, and number of anal rays in* Austromenidia regia *and* A. laticlavia

Species	Length of head (in per-cent of standard length)					Number of spines in first dorsal				Total number of anal rays				
	21	22	23	24	25	4	5	6	7	15	16	17	18	19
A. regia	1	3	8	8	1	1	20	7	2	4	10	12	-----	-----
A. laticlavia	6	7	3	1	-----	-----	-----	5	12	-----	-----	6	9	2

The Mission preserved 29 specimens, ranging in length from 38 to 163 mm. (32 to 135 mm. to base of caudal), which in part were taken in a gill net, some were gigged at night, some seined, and others were caught under a light. The specimens were collected at Supe Harbor, Mazorka Island in the Huaura group, Callao, Chilca Bay, and Independencia Bay. Fifteen additional specimens in the U. S. National Museum, mostly large ones, ranging up to 270 mm. (225 mm. to base of caudal) in length, collected at Ancon, Callao, and Paracas Bay, are also at hand.

The specimens from Peru were compared with 17 specimens of *A. laticlavia,* 65 to 245 mm. (58 to 210 mm. to base of caudal) in length, from Valparaiso and Lota, Chile. The Chilean specimens appear to be at the most only subspecifically distinct. It had been reported that Chilean specimens have a smaller head, which is confirmed by measurements based on 20 Peruvian specimens and 17 Chilean specimens now at hand. However, the difference is slight. The average number of spines in the first dorsal, and the average number of anal rays is a little greater in the Chilean specimens. These differences are shown in table 3. It is probable also that the specimens from Chile have a greater average number of vertebrae, as two of three specimens dissected had 51 vertebrae, and the other one had 52, whereas among seven specimens from Peru four had 49, two had 50, and one had 51 vertebrae.

The "pejerrey" has been reported by the Mission (1943, p. 273) as numerous in the vicinity of Pisco and Callao, Peru, and as an important and highly prized food fish.

Range.—Coast of Peru, from about Lobos de Tierra Island (lat. 6°27′ S.) southward; represented in Chile by a subspecies or variety.

Genus EURYSTOLE Jordan, 1895

Body sharply compressed; head short, deep, compressed, with margin of gill covers little convex; preopercular angle with a very small flat adherent point, or "spine"; interorbital convex; eye large, round; premaxillaries protractile; gape strongly curved; teeth in the jaws well developed; scales cycloid, adherent, small to moderately large; first dorsal with about 3 to 5 flexible spines, not nearly reaching second dorsal if deflexed, its origin at or near vertical from origin of anal; caudal forked; anal long, with about 25 to 30 rays; side with a broad silvery band.

Myers and Wade (1942, p. 126) erected a new genus, *Nectarges*, in which they placed three new species described in the same paper, including the one discussed in the present catalog. The new genus was defined as differing from *Eurystole* chiefly in having smaller scales; in having more scales on the base of the anal, forming a sheath; and in having the silvery lateral band less constricted on the caudal peduncle. These differences I regard as not of generic value, though *Nectarges* may be retained as of subgeneric rank.

EURYSTOLE NOCTURNUS (Myers and Wade)

Eurystole eriarcha Nichols and Murphy (probably not of Jordan and Gilbert), 1922, p. 506, North Chinca Island, Peru (18 specimens reported).

Nectarges nocturnus Myers and Wade, 1942, p. 133, Guayaquil, Ecuador; and Paita, and North Chincha Island, Peru (original description).

Head 4.4 to 5.0; depth 4.4 to 5.4; D. III or IV–I, 10; A. I, 25 to 28; P. 12 or 13; scales 53 to 57, 8 complete through series between bases of second dorsal and anal; vertebrae 40 (one specimen dissected).

Body strongly compressed, especially ventrally; dorsal outline only gently convex; ventral outline strongly convex anteriorly; caudal preduncle strongly compressed, its depth 2.2 to 2.8 in head; head short, deep, its greatest depth approximately equal to its length without snout; margin of opercle slightly concave just below its upper angle, rest of its posterior margin slightly convex; snout short, blunt, 4.5 to 5.2 in head; eye 2.8 to 3.4; interorbital 2.7 to 3.7; mouth terminal, quite oblique; premaxillary curved; maxillary extending below anterior margin of eye; teeth present in both jaws, pointed, mostly in 2 series anteriorly, reduced to a single series posteriorly; gill rakers scarcely longer than pupil, 15 to 18 on lower limb of first arch; scales small, cycloid, 3 complete rows between lateral band and origin of first dorsal, only 1 complete row wholly included in lateral band above base of anal, forming a sheath on base of anal, consisting of 2 rows anteriorly, reduced to a single row somewhere on posterior half of fin; first dorsal with very slender flexible spines, its origin over that of anal; second dorsal small, over posterior part of anal, the two fins being coterminal; anal long, its origin about equidistant from tip of snout and base of caudal, its base longer than head, 3.0 to 3.5 in length; ventral fins close together, inserted notably nearer tip of snout than end of anal; pectoral pointed, reaching well beyond base of ventral, nearly as long as head, 4.8 to 5.5 in length.

Color of preserved specimens yellowish above, pale below; back, including snout and mandible, coarsely punctulate with brown; top of head with a pale area, a dark spot generally present on each side of area, and another pair of dark dots usually present on snout near anterior nostrils; lateral band dark in specimens at hand, no doubt silvery in life, with a black margin above, band about three-fourths width of eye above base of anal, somewhat restricted on caudal peduncle, wider again at base of caudal; ventrals pale; other fins with dusky punctulations; anal with dark dots at base.

The Mission secured 6 specimens, 24 to 67 mm. (19 to 54 mm. to base of caudal) long, which were collected at Samanco, Tortuga Bay, Chilca Bay, and at La Lagunilla. These were taken in part with a seine, some in a dredge, and one under an electric light. The specimens listed form the basis for the foregoing description. One paratype from Paita, 52 mm. long to base of caudal, and 32 paratypes from Guayaquil, Ecuador, the largest 105 mm. (82 mm. to base of caudal) long, also are at hand. The body increases in depth with age and growth. In 5 specimens, 49 to 82 mm. long to base of caudal, the depth is contained 4.25 to 4.5 in the length, whereas in 4 specimens, 19 to 36 mm. long to base of caudal it is contained 4.75 to 5.4.

The single paratype of *Nectarges nepenthe* Myers and Wade at hand is decidedly slenderer and less strongly compressed than specimens of similar size of *E. nocturnus*, the depth being contained 4.95 in the length. It is noticed, however, that the authors had some deeper fish, as they gave a range of 4.22 to 5.22 of depth in length. In *N. nepenthe*, unless the paratype at hand is distorted which does not seem to be the case, the ventral outline anteriorly is decidedly less convex than in *E. nocturnus*. The margin of the opercle is not concave near its upper angle in the paratype of *N. nepenthe* as it is in specimens of *E. nocturnus*. It was pointed out by Myers and Wade that the lateral band in the first named species covers two complete rows of scales, whereas it includes only one row in the other species. *N. nepenthe* was described from Baja California and ranges to Oaxaca, Mexico. A third new species, *N. nesiotes*, was described in the same paper from the Galápagos Islands. This species, which I have not seen, was described as having a very broad lateral band, covering three complete rows of scales.

Range.—Guayaquil, Ecuador to La Lagunilla, or between about latitude 2°30′ to 13°56′ S.

Genus BASILICHTHYS Girard, 1854

Body long, slender; head moderately low, convex above; premaxillaries moderately curved, not protractile; scales on top of head reversed in imbrication; first dorsal small, with 1 to 6 spines, occasionally missing; anal small with about 13 to 16 soft rays.

A single species doubtfully comes within the scope of the present work.

BASILICHTHYS ARCHAEUS (Cope)

PEJERREY DE RÍO

Gastropterus archaeus COPE, 1878, p. 700, Arequipa, Peru (original description).

Pisciregia beardsleei ABBOTT, 1899, p. 342, Callao, Peru (original description).

Atherinopsis regius STEINDACHNER (not of Humboldt), 1902, p. 127, Río Tambo, Peru (description).—EVERMANN and RADCLIFFE, 1917, p. 45, Río Rimac, near Lima, Peru (description; affinity with related species discussed).

Basilichthys archaeus JORDAN and HUBBS, 1919, p. 87 (provisionally recognized as distinct from *B. microlepidotus* (Jenyns) and *B. semotilus* (Cope)).

Head 4.1; depth 5.0; D. IV–I, 11; A. I, 14; P. 15; scales 80, 17 complete through series between bases of second dorsal and anal.

Body quite elongate, compressed; dorsal and ventral outline about evenly convex; caudal peduncle rather strongly compressed, its depth 2.5 in head; head low, scarcely deeper than long, broadly convex above; snout rather long, projecting beyond mandible, 3.5 in head; eye small, round, 5.0; interorbital broad, 3.1; mouth horizontal, inferior; premaxillary moderately curved; maxillary extending below anterior margin of eye; teeth in the jaws pointed, in a band in each jaw; gill rakers about as long as pupil, 15 on lower limb of first arch; scales small, cycloid, 7 rows between lateral band and origin of first dorsal, 4 rows within lateral band; first dorsal with short slender spines, reaching less than halfway to second dorsal, its origin somewhat behind tips of ventrals; second dorsal with concave margin, its origin a little behind that of anal, the fins being coterminal; anal only a little longer than second dorsal, its origin about equidistant from bases of pectoral and caudal, its base 6.4 in length; ventral short, reaching a little more than halfway to anal, inserted about equidistant from base of pectoral and origin of anal; pectoral short, pointed, 1.4 in head. 5.9 in length.

Color of old preserved specimen brownish above; lighter below; a broad, dark lateral band, about as wide as eye (whether the band is silvery in life is not evident from descriptions); dorsals and caudal dusky; other fins pale.

The Mission did not take this species, and it doubtfully belongs to the marine fauna. It is included here because it has been recorded from Callao, though the specimen upon which that record is based may have been taken in fresh water, where others have been taken as shown by localities cited in the synonymy given at the head of this account. The description is based on a specimen 123 mm. (102 mm. to base of caudal) long, taken in the Río Rimac. The validity of this species was questioned by Jordan and Hubbs (1919), the latest reviewers of the Atherinidae.

Range.—Streams and possibly the coast of Peru.

Family POLYNEMIDAE: Threadfins

Body oblong, compressed; snout conical, piglike, projecting beyond mandible, as in anchovies (Engraulidae); eye anteriorly placed, with much adipose tissue in adults; mouth large, nearly or quite horizontal, supplied with bands of small teeth on the jaws, palatines, pterygoids, and sometimes on vomer; gill membranes separate, free from isthmus; gills four, a slit behind fourth; scales on body, head, and usually on vertical fins; lateral line complete, extending on caudal fin; dorsal fins two, well separated, the first with seven or eight flexible spines; caudal deeply forked; anal similar to second dorsal, or longer; ventrals abdominal, with one spine and five soft rays; pectorals inserted low, in two parts, the lower part consisting of free articulated filaments.

Only one of the two American genera comes within the scope of the present work.

Genus POLYNEMUS Linnaeus, 1758

BARBUDOS

Margin of preopercle with a scaly flap at lower posterior angle, the margin above it strongly serrate; scales rather thin, ctenoid; second dorsal and anal of nearly equal length, each with about 11 to 14 rays.

KEY TO THE SPECIES

a. Pectoral filaments 9; origin of anal about under middle of second dorsal; scales 67 to 75 .... **opercularis** (p. 435)

aa. Pectoral filaments 6; origin of anal approximately under that of second dorsal; scales 55 to 59 .... **approximans** (p. 436)

POLYNEMUS OPERCULARIS (Gill)

BARBUDO

Trichidion opercularis GILL, 1863c, p. 168, Cape San Lucas, Baja California (original description).

Polynemus opercularis MEEK and HILDEBRAND, 1923, p. 292, Panama City (synonymy; description; range).

Head 3.5; depth 4.25; D. VIII–I, 12; A. III, 14; P. 15; scales 67.

Body moderately compressed, its depth at origin of second dorsal fully twice as great as its thickness; caudal peduncle rather strongly compressed, its depth 2.5 in head; head compressed; snout projecting about two-thirds its length beyond tip of mandible, 5.3 in head; eye 5.0; interorbital convex, 4.3; mouth large, nearly horizontal; maxillary broad, convex posteriorly, 1.7 in head; teeth all very short, pointed, directed inward, in a broad band in each jaw, band interrupted on median line in each jaw, largely exposed with mouth closed, a broad patch on vomer, and a posteriorly pointed band of palatine-pterygoid teeth; preopercle with a projecting membranous flap at lower posterior angle, the margin above flap strongly serrate; gill rakers rather long, 21 on lower and 16 on upper limb of first arch; lateral line nearly straight, extending somewhat on caudal fin; scales thin, pectinate, the jointed ridges of the spines extending far on surface, scales extending forward on head to tip of snout, small ones on maxillary and lower jaw, densely covering second dorsal, caudal and anal, some scales present on other fins also; dorsal fins far apart, the origin of the first a little behind base of pectoral and rather nearer eye than origin of second dorsal, the third and fourth spines of about equal length, failing to reach origin of second dorsal by diameter of eye if deflexed, 5.5 in length; second dorsal somewhat elevated anteriorly, and the last ray a little produced; anal similar to second dorsal, its origin about under middle of second dorsal, its base 5.9 in length; ventral much smaller than pectoral, inserted a little nearer origin of anal than tip of mandible; pectoral long pointed, 4.7 in length, 1.3 in head; pectoral filaments 9, in part longer than head, reaching nearly to vent.

Color gray above, pale below; an obscure opercular spot present; dorsal fins and caudal dusky gray; other fins pale.

The foregoing description is based on the only specimen secured by the Mission. This fish, which is 405 mm. (306 mm. to base of caudal) long, was taken in the Gulf of Guayaquil, off Puerto Pizarro. It was compared with 3 smaller specimens, 140, 200, and 255 mm. long, from Panama. With these it agrees fairly well, except that the gill rakers are a little less numerous in the Panama fish, which all have 18 on the lower and 14 on the upper limb of the first arch. Their ventral fins reach to or beyond the vent, and their pectoral filaments reach to or beyond origin of anal. That the last-mentioned characters vary with age and therefore apparently are not significant, is evident from the Panama specimens.

A juvenile, 12 mm. long, taken in a surface net off Paita, at latitude 5°52′30″ S., longitude 81°28′30″ W., though it differs considerably from the adult, seems to belong to this species also. It has 9 separate rays on a somewhat distinct base below the pectoral, the rays are far from filamentous, as they are notably shorter than the connected rays of the pectoral. The spines in the fins are not yet fully developed. The soft rays, however, may be counted fairly accurately, the dorsal having 12, the anal 14, and the pectoral 16. The snout is very short, and projects little beyond the premaxillaries. The color is quite dark, large chromatophores being present.

Range.—Mouth of the Gulf of California to northern Peru. Previously recorded from only as far south as Panama Bay.

POLYNEMUS APPROXIMANS Lay and Bennett

BARBUDO

Polynemus approximans LAY and BENNETT, 1839, p. 57, Mazatlán, Mexico (original description).—REGAN, 1913, p. 279, Pacasmayo (fresh water), Peru.—MEEK and HILDEBRAND, 1923, p. 290, Panama Bay (synonymy; description; range).

Polydactylus approximans ABBOTT, 1899, p. 344, Callao, Peru.—STARKS, 1906, p. 783, Guayaquil, Ecuador; Callao, Peru.—EVERMANN and RADCLIFFE, 1917, p. 52, Tumbes, Peru (references; description; range).

Head 3.25 to 3.5; depth 3.0 to 3.5; D. VIII–I, 12 or 13; A. III, 14; P. 13 or 14; scales 55 to 59.

Body quite compressed, its depth at origin of second dorsal about three times as great as its thickness; caudal peduncle strongly compressed, its depth 1.9 to 2.2 in head; head compressed; snout projecting about three-fourths its length beyond mandible, 4.5 to 5.5 in head; eye 3.9 to 4.5; interorbital convex, 4.0 to 4.9 in head; mouth moderately large, nearly horizontal; maxillary broad, its posterior margin slightly concave, 2.1 to 2.2 in head; teeth and preopercle as in *P. opercularis;* gill rakers long, slender, 15 or 16 on lower and 11 or 12 on upper limb of first arch; lateral line nearly straight, forked at base of caudal, the branches extending on the fin; scales as in *P. opercularis;* dorsal fins rather remote from each other, the origin of the first a little behind base of pectoral, slightly nearer eye than second dorsal, the third spine longest, 4.0 to 4.8 in length; second dorsal elevated anteriorly, the last ray somewhat longer than the preceding one; anal similar to second dorsal, its origin under that of second dorsal, its base 4.2 to 5.1 in length; ventral much smaller than pectoral, inserted much nearer origin of anal than tip of mandible; pectoral variable in length among specimens, sometimes failing to reach tip of ventral and sometimes reaching far beyond it, usually about as long as head, 3.1 to 4.2

in length; pectoral filaments 6, variable in length, the longest sometimes scarcely reaching origin of anal, occasionally opposite middle of anal base.

Color grayish above; pale silvery below lateral line; a dark opercular spot present; pectoral dusky to black, other fins slightly dusky; pectoral filaments white.

The Mission collected five specimens, 135 to 260 mm. (96 to 185 mm. to base of caudal) long, four in the Gulf of Guayaquil, off Puerto Pizarro, and one at Lobos de Tierra Island. Those from the Gulf of Guayaquil were in part taken in an otter trawl and in part in a trammel net, and the one from Lobos de Tierra Island was seined. There is at hand, also, a specimen taken in the Tumbes River by R. E. Coker. The six specimens listed form the basis for the description. These examples were compared with others from Panama Bay, in which similarly great variations in the length of the pectoral fins and the filaments occur.

Two juveniles, 8 and 9 mm. long, taken in a surface net off Sechura Bay, at latitude 5°52′30″ S., longitude 81°28′30″ W., probably also belong to this species. They are very similar to the juvenile described under *P. opercularis*, differing, however, in having 6 instead of 9 separate rays below the pectoral fin. The separate rays are fully as short, in proportion to the connected rays of the pectoral, as in the juvenile *P. opercularis*. The fin spines are not fully developed though the soft rays may be counted fairly accurately, the dorsal having 12 or 13, the anal 14, and the pectoral apparently 15. In shape and color they agree essentially with the juvenile of *P. opercularis*.

Range.—Southern California (San Diego) to northern Peru. Abundant in Panama Bay.

Family SCORPAENIDAE: Rockfishes

Body oblong, more or less compressed; head large, rough, with bony ridges usually terminating in spines[32]; mouth large, generally nearly or quite terminal; teeth small, pointed, in bands on jaws and vomer, and often on palatines; premaxillaries protractile; maxillary broad, with a supplemental bone; a narrow bony ridge or stay on cheek; gills 4, no slit behind the fourth, the opening wide, the membranes free from the isthmus; scales moderate or small, cycloid or ctenoid; lateral line more or less concurrent with outline of back; dorsal fin continuous, sometimes rather deeply notched, with 8 to 16 spines and about an equal number of soft rays; anal with 3 spines and 5 to 10 soft rays; ventral thoracic, with 1 spine and 5 soft rays.

Four genera are now known to occur in Peru.

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[32] For the more or less usual position, and the names used in the description that follows, see fig. 86, p. 446.

KEY TO THE GENERA

a. Dorsal normally with 12 spines, and with 10 soft rays in Peruvian species.
  b. Upper pectoral rays at least in part divided; lower ones simple. **Scorpaena** (p. 438)
  bb. Pectoral rays all simple---------------------------**Pontinus** (p. 448)
aa. Dorsal normally with 13 spines, and 8 to 16 soft rays.
  c. Teeth present on palatines; dorsal with 12 to 16 soft rays. **Sebastodes** (p. 450)
  cc. Teeth missing on palatines; dorsal with 8 to 11 soft rays; 2 to 5 of upper rudimentary rays of caudal with free tips (spiny) in the species occurring in Peru---------------------------**Scorpaenodes** (p. 452)

Genus SCORPAENA Linnaeus, 1758

Body oblong, generally robust, though somewhat compressed; head large, usually little if at all compressed, with spines and sometimes with dermal tentacles and flaps; mouth large; teeth small, pointed, in bands on jaws, vomer, and palatines; scales small or of moderate size, cycloid or ctenoid, generally not covering entire head, often with dermal flaps; dorsal fin normally with 12 spines, and most frequently with 10 soft rays; anal with 3 strong spines, and generally with 5 or 6 soft rays; ventral inserted behind pectoral; pectoral large, at least some of the upper rays divided, the lower simple rays with free tips.

This genus is represented by four species in the Peruvian collections studied, three of which appear to be new. The species of this genus presumably all possess venom glands and are capable of inflicting a painful "sting" with the dorsal spines.

KEY TO THE SPECIES

a. Pectoral with 19 to 20 rays; occipital pit closed by a bony ridge at side; coronal spines missing.
  b. Head notably deeper than broad at margins of preopercle; maxillary reaching nearly or quite under posterior margin of eye; suborbital stay with a single spine---------------------------**histrio** (p. 439)
  bb. Head fully as broad as deep at margins of preopercle; maxillary reaching about under middle of eye; suborbital stay with 3 or 4 spines.
    c. A prominent pit under anterior margin of orbit; preopercle with 6 spines, next to uppermost one enlarged; occipital pit fully as long as broad; bands of teeth of palatines as broad as those on jaws; alternating light and dark lines or spots on upper lip-----**tierrae**, new species (p. 441)
    cc. Pit under anterior margin of orbit missing: preopercle with 5 spines, the uppermost one enlarged; occipital pit broader than long; bands of teeth on palatines notably narrower than those on jaws; no dark and light lines or spots on upper lip--------**afuerae**, new species (p. 443)
aa. Pectoral with 15 or 16 rays; occipital pit not closed at side by a bony ridge; coronal spines present; suborbital stay with a single spine. **peruana**, new species (p. 445)

SCORPAENA HISTRIO Jenyns

PEJE-DIABLO; PARLAMO

Scorpaena histrio JENYNS, 1842, p. 35, pl. 8, Chatham Island, Galápagos Archipelago (original description).—EVERMANN and RADCLIFFE, 1917, p. 137, Lobos de Afuera, Peru (references; description; range).—NICHOLS and MURPHY, 1922, p. 512, South Guañape Island, Peru.—MEEK and HILDEBRAND, 1928, p. 840 (references, description; range).

Head 2.35 to 2.5; depth 2.9 to 3.15; D. XII, 10, A. III, 5; P. 19 or 20; scales 45 to 47;

Body elongate, moderately compressed, its greatest thickness about two-thirds its depth; dorsal profile anterior to dorsal fin gently convex; head compressed, notably deeper than broad at margins of preopercles; caudal peduncle rather strongly compressed, 4.0 to 4.6 in head; snout moderately broad, 3.0 to 3.6; eye large 3.8 to 4.6; interorbital deeply concave, 8.3 to 11.0 or 1.6 to 2.75 in eye; mouth large, slightly oblique, lower jaw included, without evident knob at tip; maxillary broad, reaching vertical from posterior margin of pupil to posterior margin of eye, 1.75 to 2.0 in head; teeth small, pointed, in a band on each jaw, and on vomer and palatines, the band on each jaw only slightly interrupted anteriorly; occipital pit well developed, broader than long, closed at side by a well-developed ridge; spines [33] on head moderate; nasal spine fairly strong; pre-, supra-, and postocular spines rather low; tympanic, parietal, and nuchal spines in a row, moderately high; coronal spines wanting; a low, often double spine behind eye, followed by a larger spine; 2 or 3 spines in scapular region; 2 flat spines on shoulder girdle above base of pectoral, more or less concealed in large specimens; preorbital with 3 spines, the anterior ones directed forward, the other downward; suborbital stay evident, with only 1 blunt spine at its posterior end; preopercle with 6 spines, the second from above largest; opercle with 2 strong diverging spines near posterior angle; gill rakers short, spiny, those at angle not more than half length of pupil, 9 or 10 somewhat developed on lower and 5 or 6 on upper limb of first arch; lateral line slightly decurved, missing on a scale at base of caudal, and reappearing on a single scale on base of caudal, with 25 or 26 pores, anterior nostril with a large fringed cutaneous flap behind it, the second one surrounded by a slightly raised fringed margin; a broad cutaneous flap usually present behind supraocular spine, very variable in length among individuals; a simple tentacle variable in length, usually present behind preocular spine; a few small tentacles on preocular margin and on margin of snout; a variable number of cutaneous flaps along lateral line, on the scales, and above base of pectoral; scales moderately large, with smooth edges, extending forward only to nuchal spines, a few rather scattered scales on opercle and preopercle usually present, the head otherwise naked, scales extending somewhat on bases of caudal and pectoral, 4 or 5 rows between lateral line and base of first dorsal spine, and an equal number between it and last ray of dorsal; dorsal fin moderately notched, the eleventh spine about three-fourths length of twelfth, the third and fourth spines longest, 2.4 to 2.6 in head; soft part of dorsal with convex margin, the last ray bound to the back by a membrane for most of its length, the longest rays about same length as the longest spines; caudal fin rather longer than snout and eye, with convex margin, the rudimentary rays not modified; anal rather small, its origin under first soft ray of dorsal, the second spine not much longer or stronger than the third, 2.4 to 2.75 in head, the longest soft rays a little longer than the second spine; ventral inserted a little behind base of pectoral, reaching to or slightly beyond vent, 1.6 to 1.75 in head; pectoral large, extending beyond tip of ventral, 1 or 2 upper rays simple, the next 6 or 7 divided, the remainder simple and with free tips in adults, only 1 or 2 rays indefinitely divided in the smallest specimens at hand, the sixth to the eighth (counting downward) longest, 1.3 to 1.4 in head, 3.1 to 3.4 in length.

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[33] For names and general position of spines see insert of fig. 86.

General color varying from grayish to dark brown. The smaller specimens (53 and 67 mm. long) with a large dark blotch on back under spinous dorsal and another under soft part of dorsal, each extending below lateral line; another dark blotch on caudal peduncle; and three rather definite dark bars on caudal fin; anal somewhat similarly barred; ventral and pectoral largely dusky. A specimen 113 mm. long is too dark to show the marking of the smaller ones, exclusive of those on the caudal and anal fins; dorsal, caudal, and pectoral quite dark, with pale marblings. The two largest specimens, 160 and 195 mm. long, show very indefinite blotching, and each has a definite dark spot nearly as large as eye a short distance behind margin of opercle and just below lateral line; the fins are rather pale and, exclusive of the ventral, are spotted and marbled, though feebly so in next to the largest specimen.

The description is based on five specimens, 53 to 195 mm. (40 to 156 mm. to base of caudal) long. The four smaller ones were furnished by the Mission and were taken in Lobos de Afuera Bay, Chimbote Bay, and at Don Martín Island. The largest specimen was secured by R. E. Coker at Lobos de Afuera. They were compared with a specimen from the Galápagos Islands, the type locality, with which they agree. It is difficult to classify the young as to genus, because the pectoral rays are imperfectly divided, as pointed out in the description.

Range.—Panama Bay to Peru and the Galápagos and Juan Fernández Islands.

SCORPAENA TIERRAE, new species

FIGURE 84

Head 2.4, 2.5; depth 2.9, 3.0; D. XII, 10, XII, 10; A. III, 5, III, 5; P. 20, 20; scales 46, 48.

Body moderately compressed, its greatest thickness fully three-fourths its depth; head rather broader than deep at margins of preopercles; caudal peduncle strongly compressed, 3.7, 4.0 in head; snout very broad, its width at posterior end of maxillaries fully equal to length of snout and eye, its length 3.5, 4.0 in head; eye 4.75, 4.4; interorbital deeply concave, 6.25, 6.0, or 1.2, 1.35 in eye; mouth very broad, nearly terminal; lower jaw included, no knob at tip; maxillary rather broad, reaching below middle of eye, 2.0, 1.9 in head; teeth small pointed, in a band on each jaw, as well as on vomer and palatines, the band in each jaw narrowly separated on median line, not especially broadened or developed as a knob opposite the median separation; the bands on palatines as broad as those on jaws; occipital pit shallow, scarcely longer than broad; a well developed elongate pit under front of eye; spines[34] on head rather low; nasal spine well developed; pre-, supra-, and postocular spines low, blunt; tympanic, parietal, and nuchal spines also rather low and blunt; a low double spine behind eye, followed by a larger spine; scapular region with 5 or 6 low spines; 2 flat spines on shoulder girdle above base of pectoral, the upper one more or less covered with skin; preorbital with 3 spines, the first directed forward, the second a mere knob, the third directed downward; suborbital stay prominent, with 3 evident spines, and a small one at lower anterior margin of pit under eye; preopercle with 6 spines, the second from above largest, those

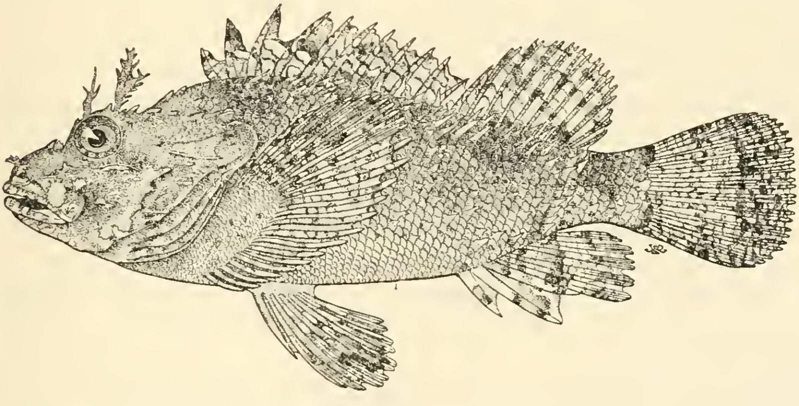

FIGURE 84.—*Scorpaena tierrae*, new species. From the type, 175 mm. long, Lobos de Tierra Bay, Peru (U.S.N.M. No. 128128).

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[34] For names of spines and their general position see insert of fig. 86.

on lower margin mere knobs; opercle with 2 strong diverging spines near posterior angle; gill rakers very short, spinous, about 7 or 8 more or less developed on lower and 5 or 6 on upper limb of first arch; lateral line decurved, missing on 2 or 3 scales at base of caudal and reappearing on 1 scale on base of caudal, with about 22 or 23 pores (difficult to see); first nostril with a large fringed cutaneous flap; a still larger fringed flap behind supraocular spine; very numerous other cutaneous fringes and flaps present almost everywhere except on chest and belly, especially prominent on margin of snout behind premaxillaries, above base of pectoral and in and above the lateral line; flaps present also on upper part of eye; many small fleshy tubercles present on cornea of eye; scales moderate, cycloid, extending forward only to occipital pit and somewhat on bases of caudal and pectoral, about 5 indefinite rows between lateral line and base of anterior dorsal spines, and 4 or 5 between it and last ray of dorsal; dorsal fin not deeply notched, the eleventh spine about four-fifths length of the twelfth, the fourth and fifth spines longest, 2.6, 2.4 in head; soft part of dorsal with convex margin, the longest rays a little longer than the longest spines; caudal fin rather longer than snout and eye, with convex margin; anal small, its origin under first soft ray of dorsal, the second spine scarcely longer than the third, 2.3, 1.9, in head, the longest soft ray notably longer than the longest spine; ventral inserted a little behind base of pectoral, reaching beyond vent, but not quite to origin of anal, 1.5, 1.6 in head; pectoral large, reaching to or beyond tip of ventral, its 2 uppermost rays simple, the next 7 divided, and the lower 11 simple in the smaller specimen, the uppermost ray simple, the next 7 divided, and the lower 12 simple in the larger specimen, the fourth to sixth ray (counting downward) longest, 1.25, 1.25 in head, 3.0, 3.1 in length.

Color dark gray above; pale muddy gray underneath; back with an indefinite dark blotch under anterior spines of dorsal, a second blotch under middle of spinous part of dorsal, and a third one under soft part of dorsal; tail abruptly paler under posterior rays of dorsal; an obscure dark saddle on peduncle just behind dorsal fin; a dark bar at base of caudal, posteriorly with a concave margin; two more cross bars on caudal fin, these broken up and interspersed with grayish markings in the larger specimen; lower part of side with dark dots; head above dark gray, with indications of dark spots, its lower surface with dark spots and elongate pale markings; upper lip dark, with a series of pale dots or lines across its margin; fins all grayish, marked with irregular dark stripes and spots; axil of pectoral dark brown, with white spots.

This species is represented in the collection furnished by the Mission by 2 specimens, 77 and 175 mm. (60 and 136 mm. to base of caudal) long, both taken in a dredge in Lobos de Tierra Bay. The larger example (U.S.N.M. No. 128128) has been designated as the type.

The proportions and enumerations given first in the description in each instance apply to the type.

The specimens described herein are related to *S. mystes* Jordan and Starks, of which a paratype, 195 mm. long, from Mazatlán, Mexico, and another one, 360 mm. long, from Acapulco, Mexico, are at hand for comparison. The Peruvian specimens differ in having a broader head, which is rather notably broader than deep at margins of preopercles, whereas these dimensions are about equal in the Mexican examples. In the Peruvian specimens the lower jaw is included in the upper one, instead of projecting beyond the upper one as in the Mexican ones. In the rather large Mexican specimens the band of teeth in the lower jaw is expanded and forms a knob anteriorly on each side of the median bare space. The knobs are especially prominent in the larger specimen suggesting that its presence and its prominence may depend upon age. No indication of such a development is present in the Peruvian examples or in a very large specimen 445 mm. long, from Juan Fernández Islands, Chile, collected by W. L. Schmitt, which seems to be identical with the specimens from Peru. Furthermore, in the Peruvian and the Juan Fernández specimens, the maxillary scarcely reaches under middle of eye, whereas it reaches nearly or quite under posterior margin of eye in the Mexican examples. Cutaneous tentacles and flaps are much more numerous and longer in the Peruvian specimens than in the Mexican ones. Although less numerous in the large example from Chile than in the smaller Peruvian ones, they still are more numerous than in Mexican specimens. The ground color of the Peruvian examples is gray, whereas it is brownish in the Mexican material. This may be of no specific importance as the color markings are very similar in all the specimens.

In addition to the material compared in the preceding paragraph, there are four specimens, 105 to 265 mm. long, from Panama Bay before me. These specimens agree with the Peruvian ones in having the lower jaw included in the upper one, and they also agree in the development of the teeth. However, in other respects they are in agreement with the Mexican specimens, with which they have been identified.

Range.—Lobos de Tierra Bay, Peru, and Juan Fernández Islands, Chile.

SCORPAENA AFUERAE, new species

PEJE-DIABLO

FIGURE 85

Head 2.33; depth 2.75; D. XIII, 10; A. III, 5; P. 20; scales 46.

Body compressed, its greatest thickness about two-thirds its depth; head large, its width and depth about equal at margins of preopercles, caudal peduncle strongly compressed, 3.75 in head; snout very broad, its width at posterior margin of maxillary exceeding length of snout and eye, its length 2.7 in head; eye 5.5; interorbital moderately concave, 6.6, or 1.2 in eye; mouth very broad, nearly terminal; lower jaw included, without a knob at tip; maxillary broad, reaching nearly under middle of eye, 1.8 in head; teeth in a broad band in each jaw, divided on median line, rather prominently so on upper jaw, the bands on vomer and palatines quite narrow; occipital pit broader than long; no pit under eye; spines [35] on head moderately developed; nasal spines rather prominent; pre-, supra-, and postocular spines moderately low and blunt; tympanic, parietal, and nuchal spines in a straight row, rather high; a double spine behind eye; three in scapular region; two on shoulder girdle above base of pectoral; preorbital with three blunt spines, the first two directed forward, the other one downward; suborbital stay preceded by two pairs of spine like ridges, the stay with four spines; preopercle with five spines, the uppermost one largest, with a small spine at base; opercle with two strong diverging spines; gill rakers short broad, spiny, seven on lower and four on upper limb of first arch, somewhat developed; lateral line decurved, remaining above middle of body nearly to base of caudal, with about 24 pores (difficult to see); first nostril with a large fringed flap, second one surrounded by a low fringed margin; a fringed flap behind pre- and supraorbital spines; a prominent series of fringed flaps along preopercular margin and on margin of snout behind premaxillaries; numerous small flaps on upper surface of head; and rather prominent ones on upper margin of eye and along lateral line; scales moderate, with fringed margins, except on chest and abdomen, the exposed surface of the scales covered with skin bearing minute fleshy papillae; scales extending forward only to occipital pit, extending somewhat on bases of caudal and pectorals, slightly embedded on chest, about 5 indefinite rows between lateral line and anterior dorsal spines, and

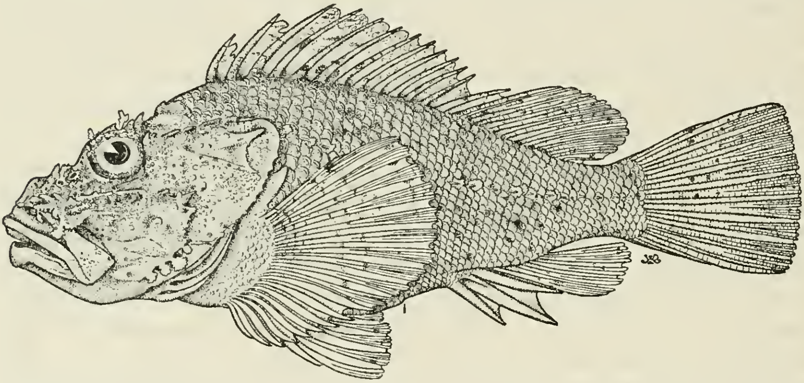

FIGURE 85.—*Scorpaena afuerae*, new species. From the type 360 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 128130).

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[35] For names of spines and their general position see fig. 86.

an equal number between it and last ray of dorsal; dorsal fin not deeply notched, the twelfth spine about five-sixths the length of the thirteenth, the fourth spine longest, being slightly longer than third and fifth, 2.4 in head, soft part of dorsal with convex margin, the longest rays as high as the longest spines; caudal fin a little longer than snout and eye, with broadly convex margin; anal small, its origin under first soft ray of dorsal, the second spine a little longer and stronger than the third, 2.5 in head, the longest soft ray, much longer than the second spine; ventral inserted a little behind base of pectoral, reaching slightly beyond vent, 1.6 in head; pectoral large, reaching beyond tip of ventral, but scarcely to origin of anal, its uppermost ray simple, the next 10 divided, the remainder simple, fifth to seventh rays longest, 1.4 in head, 3.3 in length.

Color in life, according to M. J. Lobell's field notes, "beautiful scarlet." Light gray above; pale underneath in alcohol; side with small dark spots, these smaller and indistinct on head; dorsal and pectoral slightly grayish, with indefinite dusky cross streaks and spots, inner surface of the latter with black and white spots; other fins pale, the caudal and anal with dark spots.

This species is represented by a single specimen (U.S.N.M. No. 128130), 360 mm. (280 mm. to base of caudal) long, which must serve as the type. It was taken by the Mission on a line trawl off Lobos de Afuera Island at a depth of about 20 fathoms.

This species differs from *S. tierrae* in the absence of a pit under the anterior margin of the orbit, in the shorter occipital pit, in the number and arrangement of the preopercular spines, in the notably fewer cutaneous flaps on the head and body, in color, and in several other respects, as shown in the descriptions. It differs prominently from *S. histrio* in having a broader head, wider mouth, and in the more numerous spines on the suborbital stay; from *S. thomsonii* Günther (1880, p. 24) and *S. fernandeziana* Steindachner (1875a, p. 9), both from the Juan Fernández Islands, Chile, in having 20 instead of 16 rays in the pectoral. It differs from all the species of the genus examined in the preparation of this work in having 13 instead of 12 dorsal spines. The additional spine perhaps for the present may be regarded as an abnormality.

Range.—Known only from the type taken off Lobos de Afuera Island, Peru.

SCORPAENA PERUANA, new species

FIGURE 86

Scorpaena histrio FOWLER (not of Jenyns), 1940b, p. 783, Callao, Peru.

Head 2.3 to 2.5; depth 2.4 to 2.9; D. XII, 10; A. III, 5; P. 15 or 16; scales 42 to 44.

Body deep, rather strongly compressed, its greatest thickness only a little greater than half its depth; head moderate, compressed, its width at margins of preopercle equal to about two-thirds its depth;

caudal peduncle short, 3.5 to 4.0 in head; snout 3.2 to 3.8; eye 4.0 to 5.2; interorbital deeply concave, with 2 prominent secondary ridges, its width 6.0 to 7.5; mouth large, not especially broad, nearly terminal; lower jaw only slightly included; maxillary reaching vertical from posterior margin of eye, 1.65 to 1.8 in head; teeth small, pointed, in rather broad bands on each jaw, and on vomer and palatines, the bands on the palatines about as broad as those on jaws, the one on upper jaw somewhat more prominently divided on median line than the one on lower jaw; occipital pit moderately developed, not closed by ridges at sides; a groove, rather than a pit, under eye; spines[36] on head well developed; nasal spine prominent; pre-, supra-, and postocular spines all rather large; tympanic, parietal, and nuchal spines large; coronal spines at posterior end of ridges on interorbital close to and opposite the tympanic spines; 3 or 4 short spines on posterior rim of orbit, 4 or 5 large spines between these and shoulder; a broad spine on shoulder girdle; preorbital with a large spine directed forward, sometimes with a secondary spine attached to its lower margin, and 2 connected ones directed downward and backward; suborbital stay with a single spine at its posterior end, preceded on snout by 2 low, short spineless ridges; preopercle with 6 spines, next to the uppermost one notably enlarged; opercle with 2 strong diverging spines; gill rakers short, broad, spiny, 9 or 10 on lower and 4 somewhat developed on upper limb of first arch; lateral line following outline of back more or less, with about 21 pores; first nostril with a broad fringed flap behind it, second nostril without a raised membrane surrounding it; a

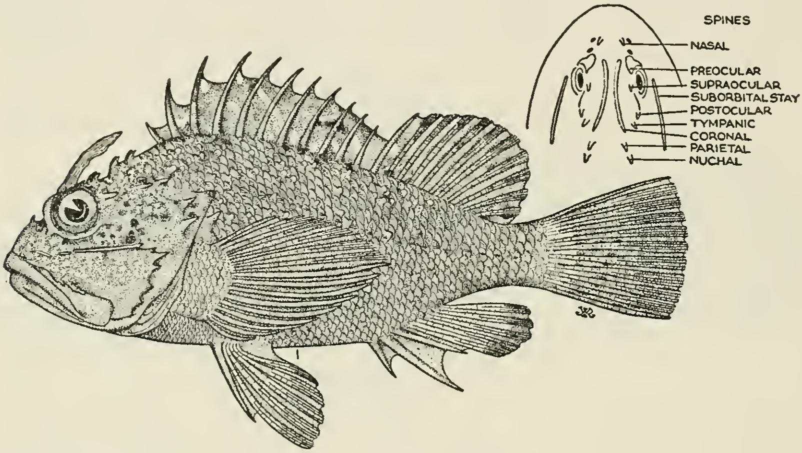

FIGURE 86.—*Scorpaena peruana*, new species. From the type, 105 mm. long, "Peru" (U.S.N.M. No. 83346). Insert, dorsal view of head, showing spines and names used for them in the descriptions.

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[36] For names of spines and their position see fig. 86.

long more or less fringed flap with longitudinal folds behind supraocular spine but none behind preocular spine; lower part of preopercular margin with cutaneous flaps, and a large one behind posterior spine on preorbital; rather numerous cutaneous flaps along lateral line, and scattered ones on side, rather more numerous above lateral line than below it, variable in number among specimens; scales moderate, rather definitely ctenoid along back, becoming cycloid below, extending forward only to nuchal spines, scattered embedded scales on cheek and opercle, 4 or 5 scales between lateral line and anterior dorsal spines, and 3 between it and last ray of dorsal; dorsal fin moderately notched, the eleventh spine two-thirds to three-fourths length of the twelfth, the fourth to sixth spines longest, 2.0 to 2.2 in head; soft part of dorsal with convex margin, the longest rays about same length as the longest spines; caudal with convex margin, about as long as head without snout; anal small, its origin under last dorsal spine, the second spine a little longer and stronger than the third, 2.0 to 2.2 in head; ventral inserted a little behind base of pectoral, reaching beyond vent, and in the type nearly to origin of anal, 1.3 to 1.5 in head; pectoral moderate, reaching to or slightly beyond tip of ventral, its uppermost ray simple, the next 5 divided, and the remainder simple, sixth or seventh ray longest, 1.1 to 1.25 in head, 2.7 to 3.0 in length.

Color of very old specimens brown; cutaneous tentacles and flaps very pale; dark and pale spots obscurely visible on head above, pale spots only on ventral surface; dorsal fin with indications of dark and light spots (most evident in the type), the membranes between the eighth to tenth or eleventh spines distally dark, the membranes between the spines elsewhere with dusky punctulations; caudal and anal with indications of dark spots; ventral brownish, with pale spots (most numerous in the largest paratype); pectoral with obscure dark and pale spots on both surfaces.

This species is represented in the collection of the U. S. National Museum by a small specimen, 53 mm. long to base of caudal, from Callao, Peru, which is in bad condition, and by three others, respectively 95, 105, and 110 mm. (74, 79, and 84 mm. to base of caudal) long, listed in the catalog as doubtfully from Peru. These specimens were collected more than a hundred years ago by the Wilkes Expedition. It is regretted that the place of collection of the larger and better specimens is not definitely known, especially as the small one from Callao is in such poor condition that it can scarcely serve as the type of the new species it represents. It is in good enough condition, however, to be quite positively identified with the other specimens, which very probably are also from Peru. Accordingly I have selected from among them a specimen (U.S.N.M. No. 83346) 105 mm. (79 mm. to base of caudal) long as the type. The following proportions and enumerations are based on that specimen: Head in

length 2.45; depth 2.5; pectoral 2.7. Eye in head 4.8; snout 3.2; interorbital 6.0; maxillary 1.7; caudal peduncle 3.5; longest dorsal spine 2.1; second anal spine 2.0; ventral 1.33; pectoral 1.1. D. XII, 10; A. III, 5; P. 15; gill rakers 4+9; scales 5–44.

The specimens herein described are the ones listed as *S. histrio* by Fowler (see reference above). However, they differ from that species, as well as from the other local forms, in the smaller number of pectoral rays and in several other respects. In the smaller number of pectoral rays they agree with *S. thomsonii* Günther (1880, p. 24) and *S. fernandeziana* Steindachner (1875a, p. 9), both from the Juan Fernández Islands, Chile, but differ in having a single instead of several spines on the suborbital stay. Furthermore, the mouth is larger, and the coronal spines are missing in *S. thomsonii* and *S. fernandeziana*.

Range.—Peru; known only from the type material.

Genus PONTINUS Poey, 1860

This genus differs from *Scorpaena* in having all the rays of the pectoral simple, and with their tips free. The suborbital stay usually bears three or four spines, the occipital pit usually is missing, and the scales generally are ctenoid.

A single species is represented in the Peruvian collections studied.

PONTINUS DUBIUS Steindachner

Puñal

Pontinus dubius Steindachner, 1902, p. 124, pl. 3, fig. 1, Paita, Peru (original description; considered somewhat doubtfully distinct from *P. furcirhinus* Garman by Steindachner).—Evermann and Radcliffe, 1917, p. 138, Paita, Peru (reference; description).

Head 2.4; depth 3.25; D. XII, 10; A. III, 5; P. 18; scales 55.

Body rather slender, compressed, its greatest thickness scarcely two-thirds of its depth; dorsal profile anterior to dorsal fin gently convex; caudal peduncle moderately slender, compressed, 4.2 in head; snout rather broad, 3.3; eye 3.9; interorbital deeply concave, 10.3; mouth large, little oblique; lower jaw slightly included, with a slight knob at tip; maxillary broad, not quite reaching vertical from posterior margin of eye, 1.95 in head; teeth small, pointed, in a band on each jaw, vomer, and palatines, the band in upper jaw separated along median line, each part with a knob covered with teeth opposite median toothless space; spines on head well developed, nasal spine strong, pre-, supra-, and post-ocular spines and tympanic spine in a row; parietal and nuchal spines in a separate row nearer midline; coronal spines wanting; a strong spine behind eye, with two small spines near its base; 4 spines in scapular region in two rows, each with two spines, those of upper row low and blunt; a flat spine directed obliquely upward attached to shoulder girdle above base of pectoral;

preorbital with two strong hooked spines; suborbital stay prominent, with four spines, the last slightly above uppermost preopercular spine; preopercle with five spines, the uppermost one largest, with a small spine at its base, the second spine smaller than the third, the anterior one on lower margin a mere blunt point hidden in skin; opercle with two strong diverging spines; gills missing in specimen at hand; lateral line descending rather abruptly under posterior part of soft dorsal, missing on two scales at base of caudal, reappearing on one scale on base of caudal; anterior nostril with a fringed cutaneous flap; a simple tentacle behind pre- and supraocular spines and behind parietal spines, blunt spine on lower margin of preopercle also with a tentacle; first six dorsal spines with a more or less distinct tentacle on posterior margin below tip; scales partly lost, strongly ctenoid, extending forward on head to nostrils, missing only on anterior part of snout, on maxillary, and on lower surface of head, extending slightly on bases of caudal and pectoral, seven rows between lateral line and first dorsal spine, five between it and last ray of dorsal fin only moderately notched, the tenth and eleventh spines of nearly equal length, the third notably higher and stronger than the others, 1.65 in head; soft part of dorsal with convex margin, the longest rays about as long as fifth spine; caudal about as long as snout and eye, with a nearly straight margin, four of the upper rudimentary rays spinelike, but not free at tips; anal small, its origin under first soft ray of dorsal, the second spine much longer and stronger than the third, 1.85 in head, the longest soft rays only a little shorter than second spine; ventral inserted a little in advance of base of pectoral, with a strong spine, the longest soft rays reaching vent, 1.6 in head; pectoral moderately broad, the rays, exclusive of the three uppermost ones, with free tips, eighth to tenth rays counting downward longest, 1.35 in head, 3.25 in length.

The color, except for some dark markings, is almost wholly faded now. It was described by Evermann and Radcliffe (see reference above) as follows: "Color in alcohol, light yellow, possibly red in life; fins yellowish, tinged with pink; soft dorsal and caudal rays spotted with black; tips of caudal and ventrals blackish; a few blackish spots in center of pectoral; traces of blackish areas on base of spinous and soft dorsal, these probably continued onto body, the loss of the scales making it impossible to determine their extent." A dark area behind interorbital, roughly bounded by the tympanic and parietal spines, not mentioned in the description quoted, is rather conspicuous.

Only one specimen, 168 mm. (133 mm. to base of caudal) long, with the gills and most of the scales missing, but otherwise in fair condition is at hand. This is the specimen described by Evermann and Radcliffe (see reference above), which was taken at Paita by R. E. Coker.

When Steindachner described *P. dubius* he considered it doubtfully distinct from *P. furcirhinus* Garman (1899, p. 51). However, Garman's specimens, taken in deep water in Panama Bay, according to his description and figure, differ in several respects from the specimen from Peru, which agrees well with Steindachner's description and figure. The body in *dubius* is more elongate (depth 2.7 in length in figure of *furcirhinus*); the eye is shorter than snout, whereas it is longer than snout in *furcirhinus;* the maxillary does not reach vertical from posterior margin of eye, but reaches a little beyond this point in *furcirhinus.* However, the most pronounced difference, if Garman's figure is correct, is in the position of the ventral fins, which is not stated in his description. In *dubius* these fins are inserted a little in advance of the pectoral fins, but shown as well behind the base of the pectorals in *furcirhinus.*

Range.—Known only from Paita, Peru.

Genus SEBASTODES Gill, 1861

Body somewhat compressed; head large, deeper than broad; mouth moderate or large, terminal, or the lower jaw projecting a little; maxillary reaching under middle of eye or beyond that point; teeth on jaws, vomer, and palatines; spines on head usually well developed; suborbital ridge or stay feebly to moderately developed; preopercle with 5 spines; opercle with 2; scales moderate or small, generally ctenoid, extending forward on head; no dermal flaps on head; dorsal fin emarginate, with 13 spines and 12 to 16 soft rays; anal with 3 spines and 5 to 9 soft rays; soft parts of vertical fins more or less scaly; caudal round to slightly forked; pectoral generally large, some of the lower rays undivided.

A single species is known from Peru.

SEBASTODES CHAMACO (Evermann and Radcliffe)

CHAMACO

FIGURE 87

Sebastichthys chamaco EVERMANN and RADCLIFFE, 1917, p. 136, pl. 12, fig. 3, Mollendo, Peru (original description; compared with *S. oculata*).

Sebastodes chamaco FOWLER, 1940b, p. 783, Callao, Peru.

Head 2.4 to 2.6; depth 2.6 to 3.0; D. XII–I, 13 or 14; A. III, 6; P. 18 or 19; scales about 68 to 75.

Body elongate, moderately compressed, its greatest thickness about half its depth; dorsal profile rather strongly elevated anterior to origin of dorsal, nearly straight over eyes to nape, caudal peduncle compressed, 3.7 to 4.0 in head; snout tapering, 3.8 to 4.1; eye large, 3.9 to 4.3; interorbital concave, 6.0 to 8.6; mouth large, somewhat oblique; lower jaw projecting, entering dorsal profile, with a well-developed knob at tip; maxillary reaching nearly or quite to vertical from posterior margin of eye, 2.0 to 2.1 in head; teeth small, pointed, in a band in each jaw, and on vomer and palatines, the band on upper jaw well separated anteriorly; spines on head only moderately prominent, consisting of rather small nasal and preocular spines, of a long supraocular ridge with a low secondary inner ridge paralleling it, postocular spine small, a long low nuchal ridge, and rather small humeral and suprahumeral spines; suborbital stay scarcely discernible; preorbital indented, without definite spines; preopercle with 5 spines, the 2 below angle very short and blunt; opercle with 2 strong flat spines near posterior angle; gill rakers short, the anterior ones on each arch scarcely more than spiny tubercles, those at angle about as long as pupil, with a small spiny knob distally, 20 to 22 on lower and 9 or 10 on upper limb of first arch; lateral line following contour of back, with about 38 to 40 pores; scales rather small, strongly ctenoid and striated, with small accessory scales, these most numerous anteriorly above lateral line, apparently becoming more numerous with age, reduced scales extending forward on interorbital, preorbital, and somewhat on maxillary, none on snout or lower surface of head, very small scales along base of dorsal, extending on soft part, and also on caudal, anal, and pectoral, about 9 or 10 series between lateral line and first dorsal spine, the series anteriorly irregular and rather difficult to enumerate, 11 to 13 vertical series on peduncle behind base of dorsal; dorsal fin deeply notched, but not quite separate, the fourth or fifth spine generally longest 2.5 to 2.8 in head, next to last spine notably shorter than the one attached to soft ray; soft part of dorsal with convex margin, the longest rays about as high as the longest spines; caudal when spread wide, with nearly straight margin; anal small, the spines strong, the second notably longer than the

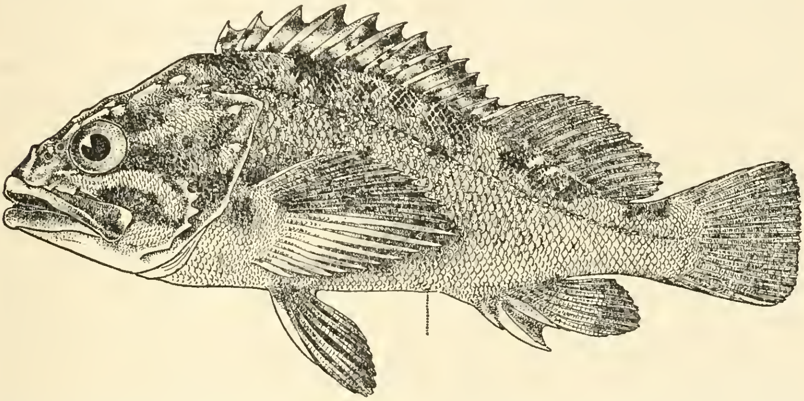

Figure 87.—*Sebastodes chamaco* (Evermann and Radcliffe). From the type, 245 mm. long, Mollendo, Peru (U.S.N.M. No. 77621). (After Evermann and Radcliffe, 1917.)

third, somewhat curved, 2.0 to 2.5 in head, the soft rays much longer than those of dorsal, fully as long as snout and eye, uniformly 6 (counting the last partly divided ray as 1); ventral inserted immediately behind base of pectoral, with a strong spine about two-thirds as long as the longest soft rays, the latter 1.6 to 1.8 in head; pectoral reaching well beyond tip of ventral, the lower 9 or 10 rays simple and thickened, the middle rays longest, 1.3 to 1.5 in head, 3.2 to 3.7 in length.

The color remains about as defined in the original description: "Color in alcohol, back reddish brown, becoming silvery gray below; maxillary with a dark reddish brown stripe in center; another, wider, parallel with preopercle, just above maxillary; indistinct traces of two more behind eyes; five dark reddish brown saddles on back scarcely reaching lateral line; the first at origin of dorsal; second under fifth to sixth dorsal spines; third under ninth to twelfth dorsal spines; fourth under third to tenth soft rays; fifth crossing caudal peduncle; some of the scales on dark area silver gray; membrane between seventh and eighth rays reddish brown; fins grayish; a brownish area on base of pectoral." All the specimens, exclusive of the type, now at hand have a distinct, small, dark spot on the opercle, which is not mentioned in the description quoted.

The description is based on six specimens, 185 to 245 mm. (152 to 202 mm. to base of caudal) long, including the type and four paratypes, collected by R. E. Coker at Mollendo, and the other one was secured by the Wilkes Expedition at Callao. A second species, *S. darwini* (Cramer), was described from "Mexillones, Peru." However, there seems to be no such locality within the present boundaries of Peru, though there is a Mejillones in northern Chile, which in all probability is where *S. darwini* was taken. Therefore, it apparently does not belong to the Peruvian fauna, and no description will be offered. It is extremely difficult to determine from descriptions wherein *S. darwini* and other nominal species from Chile and southward differ from *S. chamaco*. Only two specimens from Chile (species undetermined) are now available for comparison. Both are so badly faded that color markings are virtually lacking. They do seem to differ, however, in having smaller scales (about 90 above lateral line); accessory scales are much more numerous; and the gill rakers, though about equal in number, are notably longer (those at angle being notably longer than pupil).

Range.—Known only from Mollendo and Callao, Peru.

Genus SCORPAENODES Bleeker, 1857

This genus differs from *Sebastodes* in the absence of teeth on the palatines. Dorsal with 13 spines, 8 to 11 soft rays; anal with 3 spines, 5 or 6 soft rays; cheeks and opercles covered with scales; no dermal flaps on the scales anywhere.

SCORPAENODES XYRIS (Jordan and Gilbert)

PEJE-DIABLO

Sebastopsis xyris JORDAN and GILBERT, 1882e, p. 369, Cape San Lucas, Baja California (original description).

?*Sebastodes chincha* NICHOLS and MURPHY, 1922, p. 511, fig. 2, Chincha Islands, Peru (original description).

Scorpaenodes xyris MEEK and HILDEBRAND, 1928, p. 845, pl. 81, fig. 2, Panama Bay (synonymy; description; range).

Head 2.4 to 2.65; depth 2.9 to 3.1; D. XIII, 10; A. III, 5; P. 17 or 18; scales 44 to 46.

Body rather elongate, moderately compressed, its greatest thickness about two-thirds its depth; dorsal profile anterior to dorsal fin gently convex; caudal peduncle rather strongly compressed, 3.4 to 3.6, in head; snout broad, 4.0 to 4.5; eye large, 3.3 to 3.5; interorbital narrow, deeply concave, 8.2 to 9.4, or 2.4 to 2.7 in eye; mouth large, oblique; lower jaw included, with a slight knob at tip; maxillary reaching vertical from posterior margin of eye, 1.85 to 2.0 in head; teeth small, in a band in each jaw, and in a broad V-shaped band on vomer, the band on upper jaw divided anteriorly by a bare area; spines on head well developed; nasal spine, pre-, supra-, and postocular spines, and tympanic spine in a row, and following each other rather closely; parietal and nuchal spines forming a separate row, nearer midline; coronal spines small, strongly diverging; 2 scapular spines, one behind the other; and 1 spine above base of pectoral; suborbital stay well developed, with a spine under eye and another at its posterior end, just in front of uppermost preopercular spine; preorbital with 2 broad lobes but no definite spines; preopercle with 3 definite spines, and 1 or 2 blunt points below them, the uppermost spine largest and with a small spine at the base; opercle with two strong spines near posterior angle; gill rakers short, the anterior ones on each arch broad low tubercles, those at angle about half length of pupil, eight or nine on lower and 5 or 6 on upper limb of first arch, somewhat developed; lateral line following outline of back, generally missing on 1 or 2 scales near base of caudal, then reappearing on 1 or 2 scales on base of caudal anterior nostril with a prominent fringed or indented cutaneous flap; a similar flap on upper part of eye above anterior margin of pupil; fleshy tentacles present near tip of nearly all the spines on top of head exclusive of the nasal, preocular, and coronal spines; tentacles also present on posterior lobe of preorbital, preopercular spines, and on preopercular margin below the spines; slight tentacles attached to the pores in anterior part of lateral lines; scales firm, ctenoid, extending forward to interorbital, missing only on snout, about the mouth, and on lower surface of head, extending on bases of soft part of dorsal, caudal, anal, and pectoral, 5 rows between lateral line and first dorsal spine, 3 between it and last ray of dorsal; dorsal fin deeply notched, the fourth to sixth spines longest, 2.6 to 3.0 in head, next to last spine notably shorter than the last one; soft part of dorsal with convex margin, the longest rays rather higher than the longest spines; caudal convex, 2 to 5 upper rudimentary rays developed as spines; anal small, the second spine much larger than the third, 1.6 to 2.0 in head; ventral inserted under base of pectoral, with a strong spine, the longest rays 1.4 to 1.6 in head; pectoral broad, reaching well beyond tip of ventral, the lower 9 or 10 rays simple and with free tips, the middle rays longest, 1.3 to 1.5 in head, 3.1 to 3.4 in head.

General color brownish; back and side with indefinitely and irregularly outlined dark markings; back generally with three or four dark areas under and on base of dorsal, extending to or below lateral line, though occasionally appearing only as spots at and on base of dorsal; caudal peduncle sometimes with rather definite alternating dark and pale bars; ventral pale to slightly dusky; other fins pale, with dark spots, those on pectoral forming wavy bars.

The description is based on seven small specimens, 20 to 58 mm. (15 to 45 mm. to base of caudal) long, in the collection furnished by the Mission, which were dredged in Paita Bay, Paita Harbor, Lobos de Tierra Bay, Lobos de Afuera Bay, and in Samanco Bay. These evidently are identical with examples from Panama Bay and apparently also with a few juveniles from the Gulf of California, with which they were compared. Specimens from the Galápagos Islands, however, seem to belong to a different species. *Sebastodes chincha* Nichols and Murphy, according to the description and figure, is identical with the specimens herein described, though the modified upper rudimentary rays of the caudal (first described and figured by Nichols and Murphy) do not extend as far forward on the peduncle in any of the specimens now at hand as shown in the illustration of *S. chincha*.

Range.—Gulf of California to Peru.

Family TRIGLIDAE: Sea-robins

Body elongate, usually little if at all compressed; head encased in a bony armor consisting of rough plates, partly at least armed with spines; eyes placed high; mouth terminal or slightly inferior; premaxillaries protractile; maxillary without a supplemental bone, slipping under preorbital; teeth very small, in bands on jaws, and usually on vomer and palatines; gill membranes free from the isthmus; gills four, a slit behind the fourth; pseudobranchiae present; scales or bony plates on body; dorsal fins two, the first with spines only, the second with soft rays only; anal similar to second dorsal; ventral thoracic, far apart, with one spine and five soft rays; pectoral large, often quite long, somewhat as in flyingfishes, the three lower rays free from rest of fin and from each other, forming feelers.

A single genus and species is known from Peru.

Genus PRIONOTUS Lacepède, 1802

Head large; snout broad; opercle with 1 spine; preopercle with 2 spines; shoulder girdle with 1 spine; mouth broad; teeth very small, in a band on each jaw, and on vomer and palatines; gill rakers moderately developed; lateral line complete; scales rather small, about 60 to 100 in a lateral series; first dorsal with about 8 to 10 spines; second dorsal and anal each with about 10 to 13 rays; ventral fins far apart, with a flat space between them.

Some of the species live regularly along the shores in shallow water; others live in rather deep water. The genus is rather widely distributed on both coasts of America. The usual length attained is under 250 mm.

PRIONOTUS QUIESCENS Jordan and Bollman

Prionotus quiescens JORDAN and BOLLMAN, 1890, p. 166, *Albatross* stations 2800, 2801, 2802, 2805, in Panama Bay (original description).—MEEK and HILDEBRAND, 1928, p. 857, Panama Bay (references; description, based on type material; range).

?*Prionotus aspersus* TORTONESE (probably not of Meek and Hildebrand), 1939b, p. 366, pl. 9, fig. 2, Callao, Peru (discussion).

Head 2.0 to 2.5; depth 3.9 to 4.25; D. X–12 or 13; A. 11 or 12; P. 11 or 12+3; scales about 85.

Body little compressed, its greatest thickness about five-sixths its depth; dorsal outline convex; ventral outline nearly straight; head large, scarcely deeper than broad at margin of preopercles; snout broader than deep, emarginate anteriorly, 2.5 to 3.0 in head; eye 4.5 to 5.0; interorbital concave, 4.7 to 5.7; mouth large, nearly horizontal; lower jaw included; maxillary reaching below front of eye, 2.3 to 2.5 in head; teeth small, in bands on jaws, vomer and palatines, the band on upper jaw with a broad interruption anteriorly; no groove across head behind orbits; spines on head rather prominent; margin of snout with about 12 to 15 small spines or serrations directed more or less forward, and laterally with a rather strong spine directed backward, followed by serrations; a small preocular spine, with blunt serrations below it; a blunt postocular spine, preceded by blunt serrations; a bony ridge behind eye, ending in a blunt spine; bony armature of head ending posteriorly, in scapular region, in a prominent spine; center of radiation on cheek without a spine; opercle and preopercle each with a strong spine, the former extending well beyond opercular margin; a single strong spine on shoulder girdle above base of pectoral;

gill rakers fairly slender, those at angle fully half length of eye, 12 to 14 preceded by 5 or 6 rudiments on lower and 2 or 3 preceded by 2 or 3 rudiments on upper limb of first arch; lateral line following outline of back, with about 50 pores; scales small, difficult to enumerate accurately, strongly ctenoid, especially in young, rather larger on chest than on abdomen, with about 6 rows between lateral line and last ray of dorsal; dorsal fins well separated, the origin of the first a little in advance of margin of opercle, its spine sharp and slender, the third or fourth longest, 2.5 to 3.0 in head; second dorsal longer, consisting of soft rays only, the longest one somewhat shorter than longest spine; caudal fully as long as head without snout, with a definitely concave margin; anal with soft rays only, placed directly opposite second dorsal; ventral inserted under base of connected rays of pectoral, reaching nearly or quite to origin of anal, 1.5 to 1.6 in head; pectoral long, reaching nearly or quite to middle of base of anal, 2.0 to 2.8 in length.

Color uniformly brown above; pale underneath; membranes between the longer dorsal spines very dark distally; second dorsal with many dusky punctulations, becoming quite dark distally; caudal dusky, with two indefinite pale bars; anal and ventral pale; pectoral mostly black, its upper ray and the free ray lighter.

This species, which is new to the known fauna of Peru, is represented in the collection made by the Mission by one adult, 120 mm. (93 mm. to base of caudal) long, and four juveniles, 35 to 58 mm. (24 to 44 mm. to base of caudal) long. The adult was removed from the stomach of a bonito, presumably *Sarda chilensis*, caught off San Lorenzo Island. As the specimen is in good condition, showing no trace of digestive action, it very probably was caught by the bonito in the immediate vicinity of San Lorenzo Island. The four juveniles were taken in a purse seine at night, 3 miles off Cañete, Peru. A comparison of these specimens and three paratypes of *P. quiescens* indicates that they are identical. The type material was taken in Panama Bay, at depths ranging from 7 to 51½ fathoms. It apparently has not been taken there in shore collections, which indicates that it probably lives somewhat offshore, though the appearance of juveniles in a purse seine at night seems to show that the young at least may come to or near the surface.

Range.—Previously reported from the Gulf of California to Panama Bay. The range is now known to extend southward to Peru.

Family CONGIOPODIDAE

Body moderately elongate, compressed; snout produced; mouth small, protractile; teeth villiform on jaws, none on vomer or palatines; nostril single on each side; gill opening restricted to above pectoral; pseudobranchiae present; skin naked or granulate; head partly covered with bony plates; a bony suborbital stay present; dorsal fin single, with strong spines; anal without strong spines; ventrals thoracic, each with one spine and five soft rays; pectoral without free rays.

A single genus and species is known from Peru.

Genus CONGIOPODUS Perry, 1811

Head without strong spines; dorsal fin continuous, beginning over eye, not deeply notched between spinous and soft parts, with 16 to 21 spines; ventral inserted rather closely behind pectoral.

CONGIOPODUS PERUVIANUS (Cuvier and Valenciennes)

Peje-chancho

Agriopus peruvianus Cuvier and Valenciennes, 1829, p. 389, San Lorenzo Island, Peru (original description).—Günther, 1860, p. 138, coast of Chile (references; diagnosis).

Congiopodus peruvianus Norman, 1937, p. 126, fig. 70, various localities in Patagonian region (synonymy; list of collecting stations; description; range; relationship with several species discussed).

Head 3.3; depth 2.6; D. XVI, 14; A. I, 9; P. 9.

Body much compressed, its greatest thickness about two-fifths its depth; back very high anteriorly, dropping sharply behind middle of spinous part of dorsal; head rather short and deep, with steep forehead; snout rather pointed, 2.6 in head; eye 4.5; interorbital concave, becoming much broader posteriorly, 8.6 (over front of eye) in head; mouth small, very protractile; lips thick; maxillary 4.5 in head; teeth villiform, sometimes in a band in each jaw, sometimes in one or two irregular rows (according to Norman, 1937, p. 126), none discernible in the specimen at hand, though papillae resembling bands of teeth are present, possibly decalcified in preservative); lateral line and scales wanting; skin covered with horny tubercles in young (according to Norman, 1937, p. 126); granular bony areas about the eye, one on preorbital extending under and behind eye; another beginning over eye and extending behind eye; three more or less separate granular areas on head behind eye, and one at shoulder at upper angle of gill opening; preopercle with a slightly rough area with a long forward projection; a pair of short spines just in advance of interorbital; a few blunt spines laterally near margin of snout; pores and pits rather generally distributed over head and body; gill opening reduced to a slit, rather less than 1.5 times length of eye; dorsal fin very long, beginning over the eyes, moderately indented, next to last spine shortest, scarcely a third the length of the sixth, the latter 5.1 in head; soft part of fin much shorter than spinous part, the longest ray about twice length of shortest spine; caudal deformed in specimen at hand, with a nearly straight margin according to Norman (1937, p. 127); anal small, its origin under first soft ray of dorsal, with a single small spine, scarcely half length of longest soft ray; ventral large, reaching vent, 1.2 in head; pectoral moderately small, failing to reach tip of ventral, the rays all simple, the fourth and fifth (from above) longest, about as long as head, 3.6 in length.

Color pale, with brown markings of various sizes and shapes on back and sides; a rather definite pale streak on side in the usual position of the lateral line when present; a less distinct pale streak lower down on side; an irregular brown bar on and under anterior spines of dorsal; another broader one on middle of spinous part of dorsal; a third one on last dorsal spine; and a fourth one on soft dorsal; caudal brownish distally; anal and pectoral largely brownish; ventral with an indefinite dark bar on distal half.

This species is not represented in the Peruvian collections in the U. S. National Museum. In fact, it does not seem to have been taken on the coast of Peru by recent collectors. The description is based on a specimen with a slightly deformed caudal fin, about 185 mm. (165 mm. to base of caudal) long, taken off Montevideo, Uruguay (at lat. 36° S., long. 54° W.) at a depth of about 28 fathoms. Norman (1937, p. 127) reported specimens in the British Museum from the "coast of Chile and Peru," which he considered identical with others from both the west and east coasts of Patagonia.

Range.—"Both coasts of southern South America, from Uruguay to Peru" (Norman, 1937, p. 127).

Family COTTIDAE: Sculpins

Body elongate, round or compressed; head usually broad and depressed, though occasionally somewhat compressed (as in the form herein described), often armed with spines, though occasionally entirely unarmed; eyes placed high; teeth small, pointed, in bands on the jaws, and often on vomer and palatines; premaxillaries protractile; maxillary without a supplemental bone; gills three and a half or four; gill membranes connected, often joined to isthmus; lateral line present, simple or chainlike; scales present or absent, often replaced by prickles or bony plates; dorsal fins separate, the first consisting entirely of spines; anal fin similar to second dorsal, composed entirely of soft rays; ventral fins thoracic, rarely wanting, usually with one spine and three to five soft rays; pectorals large, the rays mostly simple.

This family is represented by a single genus and species in the collections studied; both new to the known fauna of Peru.

Genus NORMANICHTHYS Clark, 1937

Body rather elongate, slightly compressed; head flat above, a little deeper than broad, entirely without spines; margin of preopercle entire; gill membranes united, attached to isthmus; gills 4, a slit behind the fourth; branchiostegals 5; teeth wanting on vomer and palatines; normal scales covering entire body; dorsal fins relatively far apart; anal similar to second dorsal, though somewhat longer; ventral with 1 spine and 5 soft rays; pectoral not especially large or broad, with about 17 rays; vertebrae about 36.

This genus, which according to Norman (1938, p. 32) probably is the only one of the family found south of the Equator, seems to differ from all the other genera in the uniform and complete scaling of the body. The discoverer of this genus and its only species (Clark, 1937, p. 90) regarded it so unique that he believed it to represent a new family. However, Norman, in the paper just cited, showed that it may be included in the family Cottidae.

NORMANICHTHYS CROCKERI Clark

Normanichthys crockeri Clark, 1937, p. 90, with fig., Valparaiso Harbor, Chile (original description, with names for a new genus and family).—Norman, 1938, p. 29, 3 figs., off Mocha Island, Chile, and Valparaiso Harbor, Chile (discussion of affinities, chiefly as to osteology, leading to the conclusion that this species does not represent a distinct family as supposed by Clark but that it belongs to the Cottidae).

Head 3.1; depth 5.6; D. XI–10; A. 15; P. 17; scales 46.

Body quite elongate, little compressed, its greatest thickness only a little less than its depth; dorsal profile anteriorly notably less convex than ventral profile; head pointed, rather flat above; caudal peduncle slender, 5.3 in head; snout 3.8; eye 4.25; interorbital with 2 low bony ridges, concave between ridges, 5.7 in head; mouth oblique; lower jaw strongly projecting, pointed as seen from above, entering dorsal profile; maxillary reaching little beyond front of eye, 3.33 in head; teeth small, pointed, in a narrow band anteriorly in each jaw, reduced to a single series posteriorly; gill rakers rather stout, those at angle almost half diameter of eye, 14 more or less developed on lower, and 6 on upper limb of first arch; lateral line complete, with about 43 pores; scales (mostly lost in specimen at hand), strongly ctenoid, extending forward to nape, and present on chest, a few on opercle and on preopercle (opercle, exclusive of margin, glossy without outlines of scales, contrary to paratype in which round scales are visible), 13 scales on median line in advance of first dorsal, 7 between dorsal fins, 5 rows between it and first ray of second dorsal; first dorsal consisting of flexible spines only, the longest 2.0 in head, its origin a little behind base of pectoral; second dorsal consisting of slender soft rays only, a little shorter than the spines; distance between dorsal fins equal to snout and half eye; caudal damaged (with shallow fork in paratype), with 7 other rather numerous rudimentary rays extending on peduncle above and below; anal rather long and low, its origin about at vertical from midway point between dorsal fins, its base 1.4 in head; ventral inserted a little behind base of pectoral, reaching about two-thirds distance to vent; pectoral longer, reaching nearly to vent, 1.4 in head, 4.3 in length.

Color grayish brown above; pale below; back and sides of head and body everywhere with dark punctulations, these concentrated to form about nine indefinite more or less quadrate blotches along lateral line; punctulations extending on dorsal, caudal, and pectoral fins, most numerous on distal part of first dorsal; occiput with a rather dark brown area.

A single specimen, 62 mm. (53 mm. to base of caudal) long, was taken by the Mission with a purse seine in Pisco Bay. This specimen forms the basis for the foregoing description. It was compared with a paratype from Valparaiso Harbor, Chile, from which it differs only in some minor respects. The body in the Peruvian specimen is rather more robust and the opercle is glossy and is without visible scales except along its margin, whereas outlines of scales are visible over the entire surface of opercle in the paratype. Furthermore, the dark spots along the lateral line are more distinct, and quadrate rather than elongate as in the paratype. The following proportions and enumerations are based on the paratype: Head 3.4 in length; depth 5.8; pectoral 4.3. Eye 4.75 in head; snout 5.5; interorbital 8.0; maxillary 4.0; caudal peduncle 5.8; anal base 1.5; pectoral 1.5. D. X–11; A. 14; P. 17; scales 42, before first dorsal 12, between dorsal fins 8, rows between lateral line and first dorsal spine 4.

The type material from Valparaiso Harbor was taken about a submerged light; the specimens from Mocha Island in a beam trawl, at a depth of about 20 fathoms; and the specimen from Pisco Bay, in a purse seine. So far as known, then, the fish apparently may live at or near the surface, and down to a depth of about 20 fathoms.

Range.—Pisco Bay, Peru (lat. 13°50′ S.), to Mocha Island, Chile (lat. 38°22′ S.).

Family BOTHIDAE:[37] Flounders

Eyes and color normally on left side; mouth terminal or the lower jaw projecting; maxillary without a supplemental bone; no palatine teeth; nostril of blind side near dorsal ridge; preopercle with free margin; fin rays all articulated; dorsal fin beginning over or in front of upper eye; ventral with 6 or fewer rays; vertebrae not fewer than 30.

KEY TO THE GENERA

a. Body short, deep, much compressed; interorbital usually broad, flat or concave; lower eye well in advance of upper one; lateral line developed only on ocular side, with an arch anteriorly; ventral fin of ocular side median, with a long base, its first ray well in advance of first ray of that of blind side -- **Bothus** (p. 461)

aa. Body generally more elongate; interorbital usually narrower; ventral fins symmetrically placed, or that of ocular side more or less median, the latter with a short base, its first ray not far in advance of first ray of fin on blind side.

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[37] The classification of Norman (1934) as to the family and genera has been followed.

b. Ventral fins nearly symmetrically placed, that of ocular side not median; lateral line equally developed on both sides, with a prominent arch anteriorly---------------------------------- **Paralichthys** (p. 463)

bb. Ventral fins not symmetrically placed, that of ocular side median; lateral line without an arch, being nearly straight.

c. Upper jaw with a pair of canines anteriorly; lateral teeth in lower jaw strong; gill rakers few, very short, sometimes broad, spinous. **Cyclopsetta** (p. 466)

cc. Upper jaw without canines; teeth all rather small; gill rakers longer and slenderer.

d. Mouth large, the maxillary reaching beyond middle of eye (in Peruvian species); teeth about equally developed on both sides of jaws. **Citharichthys** (p. 467)

dd. Mouth small, the maxillary failing to reach middle of eye (in Peruvian species); teeth less developed on ocular side than on blind side, missing on posterior half or so of both jaws on ocular side-- **Etropus** (p. 469)

Genus BOTHUS Rafinesque, 1810

Body deep, ovate, rather thin; interorbital flat or concave, variable in width, broader in male than in female in some species; lower eye well in advance of upper; male with spines on snout and on orbital margins in some species; mouth small or of moderate size; maxillary about 2.8 to 4.5 in head; teeth in jaws small, pointed, equally developed on both sides or stronger on blind side, in two or more series, at least anteriorly, in both jaws, none on vomer; upper angle of gill opening a short distance above base of pectoral; gill rakers few, short or of moderate length; lateral line developed only on ocular side, with a distinct arch over pectoral fin, with a bifurcate branch behind upper eye; scales small, cycloid or ctenoid on ocular side, cycloid on blind side; no supplemental scales; first ray of dorsal over or in advance of nostril, well in advance of eye.

A single species, new to the fauna of Peru, is included.

BOTHUS CONSTELLATUS (Jordan)

Platophrys constellatus JORDAN, *in* Jordan and Goss, 1889, pp. 264, 266, James Island, Galápagos (original description).—MEEK and HILDEBRAND, 1928, p. 978, Galápagos Islands and Panama Bay (references; description; range).—NORMAN, 1934, p. 232, fig. 176 (synonymy; description; range).

Head 3.5 to 4.0; depth 1.4 to 1.7; D. 85 to 90; A. 62 to 68; P., ocular side 11 or 12, blind side 10 or 11; scales about 72 to 79.

Body ovate, very thin; profile slightly concave in front of eyes; head short, deep; caudal peduncle very short, moderately deep, 2.25 to 2.7 in head; snout in front of lower eye 4.6 to 5.0; lower eye its full length in advance of upper one, 3.8 to 4.5 in head; interorbital very broad and definitely concave in adults, proportionately much narrower in small specimens, 3.1 to 3.9 in head; mouth small, oblique; lower jaw projecting slightly; maxillary extending under anterior margin of eye, 3.8 to 4.5, in head; teeth minute, principally in a single close-set series sometimes at least with a more widely spaced outer series anteriorly, teeth not extending to angle of mouth on ocular side; gill rakers short and thick, 9 to 11 on lower and 5 to 7 on upper limb of first arch; lateral line well developed on ocular side, very indefinite on blind side, with a short, high arch over pectoral on ocular side, its chord rather less than twice diameter of eye, with a V-shaped branch behind upper eye; scales small, ctenoid on ocular side, cycloid on blind side, extending forward on interorbital, but not on snout, extending also on caudal, and on some of the rays of dorsal and anal; first ray of dorsal over anterior nostril, well in advance of lower eye; caudal somewhat pointed, the middle rays about as long as head; first ray of anal under base of pectoral; ventral of ocular side median, with a long base, that of blind side with short base, the rays of each of about equal length 2.0 to 2.6 in head; pectoral of ocular side rather long, 1.1 to 1.25 in head, that of blind side shorter, 1.75 to 2.2 in head.

Color varying from rather dark brown to grayish; the light-colored specimens with distinct pale spots surrounded by a dark, dotted circle, the center of spot sometimes with a dark dot, the pale spots only faintly visible on dark specimens; pale specimens also with many dark specks or markings of various shapes, these extending on the fins, dark specks or spots few on dark individuals; a series of four or five dark blotches sometimes present in straight part of lateral line, the largest one somewhat behind midlength, present in all specimens at hand; fins plain, except for dark specks.

The description is based on seven specimens, 65 to 100 mm. (52 to 78 mm. to base of caudal) long. These specimens, and two juveniles 37 and 39 mm. long, were secured by the Mission in Samanco Bay, Tortuga Bay, and in Chilca Bay in shallow water. The juveniles differ from the larger specimens chiefly in being slenderer, the eyes are much closer together, and the lower one is little in advance of the upper. The color pattern already is rather fully developed in the larger specimen, though less completely in the smaller one. In the following proportions, which are based on these juveniles, those pertaining to the smaller one are given first: Head in length 4.0, 4.05; depth 1.85, 1.95. Eye in head 4.1, 3.8; snout in advance of lower eye 6.3, 4.0; interorbital 11.5, 7.6; maxillary 4.6, 4.0; caudal peduncle 2.3, 2.2; pectoral, ocular side 1.6, 1.3, blind side 2.6, 2.5.

The Peruvian specimens were compared with others from the Galápagos Islands, Panama Bay, and Mexico. Small specimens from Port Utria, and Gorgona Island, Colombia, collected by W. L. Schmitt, and a large one, taken by the *Albatross* (station 3369), in the vicinity of Cocos Island, off the coast of Panama, in 66 fathoms, also are at hand. All specimens examined seem to be of one species, though a few specimens were labeled "*Platophrys leopardinus*." Norman (1934, p. 221, see key), who examined the type of *leopardinus*, a specimen 147 mm. long, regarded it as distinct from *constellatus* because it has a slenderer body, a narrower interorbital, and fewer pectoral rays, its depth being contained 1.8 in the length, the interorbital equalling the width of the eye, and the pectoral having 10 rays. In all these respects it differs from the adult specimens now at hand.

A specimen from the vicinity of Cocos Island, off the coast of Panama, has a distinct spine just behind premaxillary on ocular side. Several other specimens have a decided protuberance in the same place though not a definite spine. Specimens with this protuberance or spine may be regarded as males.

Range.—Baja California to Peru and the Galápagos Islands. Reported from "Low Archipelago, Oceania" (Norman, 1934, p. 233). Previously not recorded from Peru.

Genus PARALICHTHYS Girard, 1858

Body ovate or oblong, not especially strongly compressed; interorbital generally moderately wide and flat; mouth large, oblique, maxillary about half length of head; teeth in jaws pointed, in a single series, none on vomer; gill rakers rather long and slender; lateral line equally developed on both sides, with a prominent arch above pectoral fin, supratemporal branch of lateral line often not distinctly developed; scales small, cycloid or ctenoid, minute accessory scales present (except in small specimens), small scales extending on rays of unpaired fins; first ray of dorsal over, or a little in front of, anterior part of eye; interhaemal spine weak, not projecting in front of anal; ventral fins subequal, nearly symmetrically placed; pectoral fins unequal, that of ocular side the larger.

Two species are known to occur in Peru.

KEY TO THE SPECIES

a. Scales of ocular side sharply ctenoid; 15 to 19 gill rakers on lower limb and 6 or 7 on upper limb of first arch------------------------**adspersus** (p. 463)

aa. Scales cycloid; 11 to 13 gill rakers on lower and 4 or 5 on upper limb of first arch--**woolmani** (p. 465)

PARALICHTHYS ADSPERSUS (Steindachner)

Lenguado

Pseudorhombus adspersus Steindachner, 1867, p. 9, pl. 2, "Chinchas Islands," Peru (original description).

Paralichthys adspersus Jordan and Goss, 1889, p. 246, Callao, Peru (synonymy; description, based on Peruvian specimens; range, stated as extending from "Cape San Lucas to Peru." Specimens from Panama Bay and northward now are known to be of a different species).—Abbott, 1899, p. 363, Callao, Peru (synonymy; note on differences between this species and *P. sinaloae* Jordan and Abbott, with which it had been confused).—Starks, 1906, p. 800, Callao, Peru.—Evermann and Radcliffe, 1917, p. 140, Callao and Mollendo, Peru (synonymy; description).—Nichols and Murphy, 1922, p. 512, Chincha Islands, Independencia Bay, and Callao market, Peru.—Norman, 1934, p. 83, fig. 49, Peru and Chile (synonymy; description; range).

Head 3.2 to 3.5; depth 2.0 to 2.3; D. 67 to 75; A. 54 to 59; P. 11 or 12, rarely 13; scales about 95 to 112.

Body fairly elongate; profile straight to slightly concave in front of eyes; head moderately large; caudal peduncle very short, 2.2 to 2.9 in head; snout (in front of lower eye) 4.1 to 4.9; eye 6.2 to 7.1; interorbital narrow, flat, increasing greatly in width with age, 1.25 to 3.5 in eye; mouth large, oblique, terminal or more usually with somewhat projecting lower jaw; maxillary almost as broad as eye in large specimens, proportionately narrower in young, reaching nearly or quite below posterior margin of eye, 2.1 to 2.4 in head; teeth sharply pointed, largest anteriorly; mandible with a rather prominent knob at symphysis, and another posteriorly; gill rakers rather long and slender, with small denticles along inner edge, those at angle about three-fourths length of eye, 15 to 19 on lower and 6 or 7 on upper limb of first arch; lateral line with a rather short arch, its chord 2.0 to 2.3 in head; scales small (difficult to enumerate accurately), strongly ctenoid on ocular side, cycloid on blind side, accessory scales present, especially numerous in large examples, small scales extending on rays of unpaired fins, and on head to interorbital; first ray of dorsal over or a little posterior to anterior rim of orbit; caudal slightly angulate or double truncate in large examples, the middle rays longest, often as long as head without snout; first ray of anal under or a little in advance of base of pectoral; ventrals of about equal size, the one of ocular side not on ventral ridge, 2.9 to 3.5 in head; pectorals more or less rounded, the one on ocular side considerably the longer, 1.8 to 2.1, the one on blind side 2.4 to 2.9 in head.

Color brown to gray, variously marked with dark and sometimes with pale spots and blotches; often with a rather large ocellated spot under distal part of pectoral, sometimes with several such spots; occasionally with pale spots and specks all over body and on fins, such spots often entirely wanting; fins generally rather lighter than body, the unpaired ones usually spotted like the body; pectoral and ventral of ocular side with small dark spots, those of pectoral often arranged in cross rows.

The Mission preserved 29 specimens, 165 to 255 mm. (133 to 216 mm. to base of caudal) long. These, together with some larger ones from Peru, up to 390 mm. (315 mm. to base of caudal) long, in the collection of the U. S. National Museum, form the basis for the foregoing description. The specimens mostly were seined on sandy shores, though some were taken with a trammel net, and one lot with an otter trawl hauled at a depth of 10 to 15 fathoms. The species seems to occur along the entire coast of Peru, the specimens at hand having been collected at Lobos de Tierra Island, Isla Santa, Chimbote Bay, Samanco Bay, Pachacamac Island, Chilca Bay, Point Ripio, La Lagunilla, Independencia Bay, San Juan Bay, and Coles Point. R. E. Coker obtained specimens at Callao and Mollendo, which also are before me. I have also examined small specimens from Tomé and Lota, Chile.

The report of the Mission (1943, p. 284) indicated that flounders ("lenguado") are of moderate commercial importance in Peru. As the species are not separated for the market, and presumably are not recognized, it is not known definitely which ones enter into the commercial catch. It seems highly probable, however, that it is composed almost entirely of *P. adspersus* and *P. woolmani*, as the other species herein described apparently do not grow large enough to be of much commercial value. Judging further from the general distribution and the rather numerous specimens preserved of *P. adspersus* in comparison with the apparently limited distribution in Peru and few specimens preserved of *P. woolmani*, we may conclude that the commercial catch very probably is made up principally of *P. adspersus*. The report of the Mission stated further that the local fishery for flounders is carried on with haul seines, trammel nets, hand lines, cast nets, and spears. Nearly the entire catch is said to be consumed in the fresh state, and the fish are highly regarded as food and are served in many of the better restaurants.

Range.—Coasts of Peru and Chile.

PARALICHTHYS WOOLMANI Jordan and Williams

LENGUADO

Paralichthys woolmani JORDAN and WILLIAMS, *in* Gilbert, 1897, p. 457, Panama Bay, erroneously credited to the Galápagos Islands (original description).—EVERMANN and RADCLIFFE, 1917, p. 140, Paita, Peru (synonymy; description; distinguishing characters of this species and *P. adspersus*).—MEEK and HILDEBRAND, 1928, p. 974, Panama Bay (synonymy; description; range).—NORMAN, 1934, p. 86, fig. 51, Baja California, Panama Bay, and Galápagos Islands (synonymy; description; range).

Head 3.4 to 3.6; depth 2.2 to 2.3; D. 73 to 82; A. 55 to 62; P. 11 or 12; scales about 95 to 115.

Body fairly elongate; profile concave in front of eyes; head rather small; caudal peduncle short, 2.2 to 2.6 in head; snout (in front of lower eye) 4.2 to 4.7; eye 6.25 to 8.2; interorbital narrow, without definite ridges, about 1.2 to 3.1 in eye; mouth large, oblique, terminal, or the lower jaw slightly projecting; maxillary almost as broad as eye, reaching below or a little beyond posterior margin of lower eye, 2.05 to 2.2 in head; teeth sharply pointed, largest anteriorly; mandible with a rather prominent knob at symphysis, and another posteriorly; gill rakers with strong denticles along inner margin, those at angle about two-thirds length of eye, 11 to 13 on lower and 4 or 5 on upper limb of first arch; lateral line with a rather long arch; its chord 1.75 to 1.9 in head; scales small (difficult to enumerate accurately), cycloid, accessory scales rather numerous, small scales extending on rays of unimpaired fins, and on head to interorbital; first ray of dorsal over anterior rim of orbit; caudal slightly angulate, the middle rays longest, somewhat shorter than head; first ray of anal under base of pectoral;

ventral fins of about equal size, the one of ocular side not quite on ventral ridge, 2.9 to 3.3 in head; pectorals more or less rounded, the one on ocular side somewhat the longer, 1.9 to 2.25, and the one of blind 2.5 to 2.75 in head.

Color of body and unpaired fins brownish to gray, with dark blotches, and some specimens also with pale spots, especially distinct on caudal and posterior parts of dorsal and anal; pectoral and ventral paler than body, with small dark spots, those of pectoral arranged in cross rows in some specimens.

Four specimens, 230 to 610 mm. (185 to 512 mm. to base of caudal) long, taken at Cabo Blanco and at Lobos de Tierra, are included in the collection furnished by the Mission and form the basis for the description offered. The largest one was caught on a line trawl in about 12 fathoms, and the others were taken with a seine. These seem to be identical with others from Panama Bay, with which they were compared.

This species is close to *P. adspersus*, from which it differs in having cycloid scales on the ocular side, fewer and rather coarser gill rakers, and a slightly longer arch in the lateral line.

Range.—Baja California to northern Peru, and the Galápagos Islands.

Genus CYCLOPSETTA Gill, 1889

Body oblong; interorbital flat, narrow or of moderate width, similar in both sexes; mouth large, oblique; lower jaw included; maxillary reaching under, or more usually beyond middle of eye, often fully half length of head; teeth in a single series in each jaw, upper jaw anteriorly with a pair of canines, its lateral teeth rather small, the lateral ones of lower jaw all strong, notably larger than those of upper jaw; gill rakers few, very short, sometimes broad and with several spines; lateral line nearly straight, with or without a supratemporal branch; scales small, cycloid or ctenoid; first ray of dorsal in advance of upper eye, generally about over posterior nostril; none of the rays of pectoral produced.

A single species, previously known only from Panama Bay, is herein reported from Peru.

CYCLOPSETTA QUERNA (Jordan and Bollman)

LENGUADO

Azevia querna JORDAN and BOLLMAN, 1890, p. 174, Panama Bay (original description; compared with *A. panamensis*).

Cyclopsetta querna JORDAN and EVERMANN, 1898, p. 2675 (reference; description).—MEEK and HILDEBRAND, 1928, p. 991, Panama Bay (synonymy; description; range).

Head 3.5, 3.6; depth 2.2, 2.2; D. 88, 89; A. 72, 74; P. 16, 17 on ocular side, 14, 14 on blind side; scales 90, 98.

Body moderately elongate, rather thin; profile convex over head;

head rather large; caudal peduncle short, moderately deep, 2.8, 2.9 in head; snout in front of lower eye 5.1, 5.4; eyes about equally advanced, fully lateral, 6.4, 6.5; interorbital slightly concave, 3.0, 3.0 in eye; mouth large, oblique, terminal; jaw curved; maxillary ending far below posterior margin of eye 1.9, 1.9 in head; teeth in a single series in each jaw, rather widely spaced, upper jaw anteriorly with a pair of canines, the lateral teeth rather small, those of lower jaw notably larger than lateral ones of upper jaw; gill rakers oddly shaped, with broad base each bearing three to five points, 9, 9 on lower and 4, 5 on upper limb of first arch; margin of opercle, especially that of blind side, finely fringed; two small dermal flaps just behind margin of opercle and below base of pectoral on ocular side; lateral line with slight upward curve over pectoral, the pores with long branches, tubercles present on postocular part of head, but not distinctly connected with lateral line; scales small, cycloid on both sides, extending on rays in anterior parts of dorsal and anal, and on rays on caudal, and forward on interorbital; first ray of dorsal over posterior nostril, well in advance of upper eye; caudal somewhat angulate, the middle rays longest, slightly longer than postocular part of head; first ray of anal well in advance of base of pectoral; ventral of ocular side median, about same length as that of blind side, 2.7, 2.7 in head; pectorals rounded, the one of ocular side the larger, with two or three more rays than that of blind side, 1.9, 2.0 in head, that of blind side 2.4, 2.7 in head.

Color nearly uniform brown; dermal flaps on shoulder girdle nearly black; pectoral with light spots, forming more or less distinct, wavy, cross lines.

This species is described herein from two specimens, 182 and 178 mm. (148 and 145 mm. to base of caudal) long, taken by the Mission in an otter trawl on sandy bottom in about 3 fathoms, in Sechura Bay. These have been compared with three from Panama Bay, the type locality, one of them a paratype, and were found to agree in virtually all respects.

Range.—Panama Bay to northern Peru.

Genus CITHARICHTHYS Bleeker, 1862

Body ovate or oblong; interorbital generally rather narrow, consisting of a bony ridge or concave space, sometimes broader in male than in female; mouth rather large, the maxillary reaching well beyond anterior margin of eye; teeth in jaws rather small, pointed, in a single complete series on both sides of jaws, none on vomer; gill rakers short or of moderate length, rather slender; lateral line without an arch; scales cycloid or finely ctenoid; origin of dorsal fin in advance of upper eye; ventral fin of ocular side median; pectoral of ocular side the larger, none of its rays especially produced.

A single species comes within the range of this catalog.

CITHARICHTHYS GILBERTI Jenkins and Evermann

Tapadero

Citharichthys gilberti Jenkins and Evermann, 1889, p. 157, Guaymas, Mexico (original description).—Evermann and Radcliffe, 1917, p. 141, Tumbes, Peru (references, description; range).—Meek and Hildebrand, 1928, p. 987, Panama Bay (synonymy; description; range).—Norman, 1934, p. 152, fig. 105, Mexico, Panama, and Ecuador (synonymy; description; range).

Head 3.5 to 3.8; depth 2.1 to 2.25; D. 85 to 89; A. 61 to 66; P. 10 or 11 on ocular side, 9 or 10 on blind side; scales 46 to 50 on ocular side, 44 to 47 on blind side.

Body oblong, rather thin; profile scarcely concave over eyes; head rather small; caudal peduncle very short, deep, 1.9 to 2.3 in head; snout (in front of lower eye) 5.3 to 5.7; eye 5.6 to 7.25; interorbital a narrow bony ridge in small specimens, somewhat broader and flat in large ones, 3.1 to 5.5 in eye; mouth rather large, strongly oblique, terminal; jaws curved on each side; maxillary reaching under posterior margin of pupil, 2.5 to 2.7 in head; teeth rather small, sharp, largest anteriorly; gill rakers moderately slender, the longest ones about two-thirds length of eye, 13 to 15 on lower and 5 or 6 on upper limb of first arch; lateral line slightly decurved over pectoral; scales moderately large, smaller anteriorly, finely ctenoid on ocular side, cycloid on blind side, accessory scales few, present principally along lateral line, small scales extending on the rays of the unpaired fins and forward to interorbital, 2 or 3 fewer in lateral series on blind side than on ocular side; first ray of dorsal over posterior nostril, a little in advance of upper eye; caudal round to slightly angulate, the middle rays longest, a little shorter than head; first ray of anal under, or slightly behind, base of pectoral; ventrals of about equal length, the one of ocular side on ventral edge, 2.7 to 3.25 in head; pectorals more or less pointed, the longest rays in upper part of fin, the fin on ocular side the longer, and sometimes with one more ray, 1.75 to 2.0, and that on blind side 2.2 to 2.5 in head.

Color brown, with dark blotches; fins lighter, the dorsal and anal with rather large dark markings, variable, the other fins of ocular side with smaller dark spots or specks.

This species was recorded from Tumbes, Peru, by Evermann and Radcliffe (see reference above) from two specimens secured by R. E. Coker, one of which is before me now. The description is based on this specimen and four others collected at Guayaquil, Ecuador, by W. L. Schmitt. These five specimens, all from the Gulf of Guayaquil, ranging in length from 120 to 215 mm. (96 to 170 mm. to base of caudal), were compared with several from Panama Bay and one from Mexico and were found to agree very well.

Range.—Baja California to northern Peru.

Genus ETROPUS Jordan and Gilbert, 1882

Very close to *Citharichthys*, differing in having a smaller mouth, the maxillary failing to reach far beyond anterior margin of eye; teeth less developed or wanting posteriorly in jaws of ocular side; eyes always separated by a bony ridge; gill rakers few, short or of moderate length.

KEY TO THE SPECIES

a. Eye partly in median dorsal ridge; dorsal with 89 to 96 rays; anal with 68 to 78; scales 54 to 59; none of the rays of pectoral on ocular side prolonged--**ectenes** (p. 469)

aa. Eye distinctly on left side of median dorsal ridge; dorsal with 82 to 86 rays; anal with 63 to 65; scales 41 to 47; third ray of pectoral on ocular side rather notably prolonged---------------**peruvianus**, new species (p. 470)

ETROPUS ECTENES Jordan

LENGUADO

Etropus ectenes JORDAN, *in* Jordan and Goss, 1889, p. 277, Callao, and "Paraca Bay" (Pisco), Peru (original description, principally in key on same page).—NORMAN, 1934, p. 155, fig. 107, "Paraca Bay," Peru (reference; description; range).

Head 4.1 to 4.8; depth 2.1 to 2.6; D. 89 to 96; A. 68 to 78; P. 10 to 12; scales 55 to 57.

Body oblong, quite thin; profile somewhat concave over head; head small; caudal peduncle very short, deep, 1.7 to 2.25 in head; snout in front of lower eye 7.5 to 8.6; eyes equally advanced or the lower somewhat in advance of upper, the upper one partly in median ridge, directed upward rather than laterally, 4.5 to 5.1 in head; interorbital with sharp bony ridge over lower eye, very narrow in small specimens, proportionately broader and slightly concave in large ones; mouth small, oblique, terminal; jaws not noticeably curved; maxillary reaching under anterior margin of pupil, 4.4 to 5.1 in head; teeth small, slightly compressed at least in large specimens, in a single close-set series in each jaw, missing on posterior half or so of both jaws on ocular side; gill rakers short, moderately slender, scarcely longer than pupil, eight or nine on lower and four to seven on upper limb of first arch; lateral line nearly straight, some specimens with a distinct supratemporal branch; scales moderately large, becoming smaller on anterior part of body and on head, finely ctenoid on ocular side, cycloid on blind side, accessory scales evident only along lateral line, small scales extending on rays of unpaired fins, and forward on interorbital; first ray of dorsal on blind side, over or a little in advance of middle of upper eye; caudal rounded to slightly angulate, middle rays longest, equal to or a little shorter than head; first ray of anal generally less than an eye's diameter behind base of pectoral; ventral of ocular side median, generally slightly shorter than that of blind side, 2.4 to 2.7 in head; pectorals more or less pointed, usually with an equal number of rays on each side, the one of ocular side the longer, 1.3 to 1.5, and that of blind side 1.9 to 2.4 in head.

Color grayish to brownish, with dark spots or rather large blotches, variable among individuals, some specimens with pale specks and spots; fins of about same color as body, also often spotted, the spots on pectoral if present quite small.

This species, previously known only from the type material from Callao, and "Paraca Bay" (Pisco), Peru, is represented in the collection furnished by the Mission by 12 specimens, 50 to 200 mm. (41 to 163 mm. to base of caudal) long, taken in Sechura Bay, in Lobos de Tierra Bay, Chimbote Bay, Samanco Bay, off Don Martín Island, and in Chilca Bay. The specimens were all taken in shallow water, mostly with seine, dredge, or otter trawl.

This species is remarkable because of the position of the upper eye, which is partly in the median dorsal ridge, and "looks upward," appearing as if it had failed to complete the migration from the right to the left side.

Range.—Known only from the coast of Peru.[38]

ETROPUS PERUVIANUS, new species

FIGURE 88

Head 4.0, 3.9, 3.4; depth 2.5, 2.5, 2.9; D. 82, 86; A. 64, 65; P. 10, 10; scales 48, about 43, about 48.

Body elongate, quite thin; profile evenly convex over head; head moderate; caudal peduncle fairly slender, 2.4, 2.4, 2.8 in head; snout in front of lower eye 6.4, 6.0; eyes equally advanced, the upper one well across median ridge, 4.0, 3.75, 3.6 in head; interorbital a bony ridge, narrower than pupil; mouth fairly small, oblique, terminal; jaws curved; maxillary reaching under anterior margin of pupil, 4.0, 4.7, 4.5 in head; teeth small, in a single, close-set series in each jaw, missing on less than half of upper jaw on ocular side; gill rakers very small, nine, eight on lower and four, five on upper limb of first arch; lateral line nearly straight, the larger paratype with a few branched pores in temporal region, none evident in the other specimens; scales rather large, partly lost, finely ctenoid on ocular side, cycloid on blind side, no accessory scales evident, small scales extending on rays of unpaired fins, and forward on head to interorbital; first ray of dorsal over anterior part of eye; caudal somewhat pointed, the middle rays longest, a little shorter than head; first ray of anal under base of pectoral; ventral of ocular side median, apparently a little shorter than that of blind side, 2.3, 2.1 in head; pectoral on ocular side with third ray produced, 1.25, 1.25 in head, that of blind side broken in specimens at hand.

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[38] The range as given by Norman (see reference above) is "Pacific Coast of South America." However, I have found no record of specimens taken anywhere except on the coast of Peru.

Color of type grayish brown; a large dark area behind margin of opercle, with a long backward extension; body elsewhere with indefinite dark markings; fins paler than body, with dark specks; pectoral with a dark bar on distal fourth. The larger paratype, a specimen long in alcohol, rather faded, yet with suggestions of markings as in the type. The smaller paratype, a juvenile, grayish, with only a few dark specks.

This apparently new species is represented in the Peruvian collection furnished by the Mission by the type (U.S.N.M. No. 128166), 80 mm. (65 mm. to base of caudal) long, taken with an otter trawl in Sechura Bay and a specimen 53 mm. (42 mm. to base of caudal) long dredged in Paita Bay. A juvenile, 17 mm. to base of caudal (caudal fin broken), secured at Paita by W. L. Schmitt, and a fourth specimen, 75 mm. (58 mm. to base of caudal) long, taken by the *Albatross* at the Pearl Islands, Panama Bay, in 16 fathoms, were also studied. The proportions and enumerations given first in the description are based on the type; the next ones are based on the 53-mm. specimen from Paita Bay; those given next on the Panama Bay specimen; and the fourth ones, if given, are based on the juvenile.

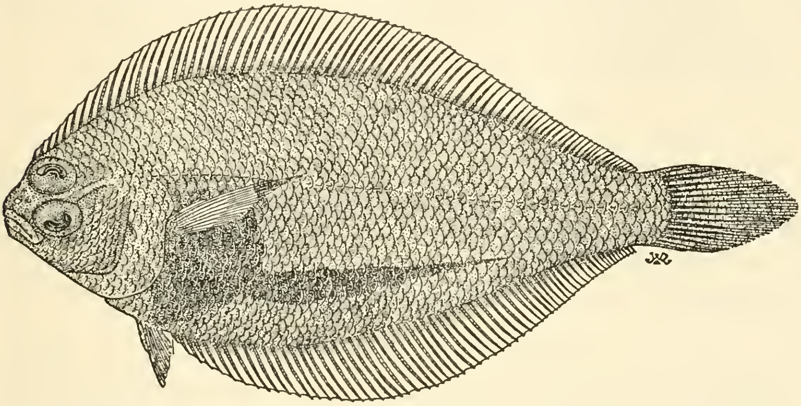

FIGURE 88.—*Etropus peruvianus*, new species. From the type, 80 mm. long, Sechura Bay, Peru (U.S.N.M. No. 128166).

This species differs from *E. ectenes*, the only species of the genus heretofore recorded from Peru, chiefly in the characters mentioned in the key. It differs from *E. crossotus* Jordan and Gilbert, a widely distributed species on both coasts of America and common in Panama Bay though not known from Peru, in the much slenderer body (depth in length in 10 specimens of *crossotus* from Panama Bay 1.9 to 2.1); in having the mouth terminal and the jaws curved, whereas the lower jaw projects and both jaws are straight in *crossotus;* in having the third ray of the pectoral free distally and produced, which is not true of *crossotus;* and in several minor respects. It is near *E. longimanus* Norman, known from the coasts of Brazil and Argentina, with which it agrees, according to Norman's description and figure, in the prolonged ray of the pectoral, and approximately in the elongate body, the depth being contained in the length in *longimanus* 2.25 to 2.5. It seems to differ in having a slightly larger mouth, as the maxillary reaches under the anterior margin of the pupil, whereas in *longimanus* it reaches under the anterior margin of the eye. Furthermore, the jaws are distinctly curved, whereas they are shown as straight in *longimanus;* the eyes are equally advanced in *peruvianus*, while in *longimanus* the lower is a little in advance of the upper one. Enumerations indicate slight differences in the number of gill rakers, and pectoral rays, as *peruvianus* has 9 gill rakers on the lower limb of first arch, instead of 6 or 7, and 10 instead of 9 rays in the pectoral.

Range.—Panama Bay to northern Peru.

Family SOLEIDAE: Broad Soles

Body oblong or oval; eyes small, close together on right side; preopercle without a free margin, being hidden by skin and scales; caudal fin free from the dorsal and anal; ventral of ocular side free or continuous with the anal.

A single genus, new to the fauna of Peru, is included.

Genus ACHIRUS Lacepède, 1802

Body oval, broadly rounded anteriorly; mouth small, turned to ocular side; teeth minute or wanting; gill openings not confluent below; scales strongly ctenoid on both sides; first ray of dorsal over snout; ventral fins present, the one of ocular side continuous with anal; pectoral of ocular side small or obsolete, none on blind side.

A single species, previously unknown from Peru, is included.

ACHIRUS FIMBRIATUS (Günther)

Solea fimbriata GÜNTHER, 1862, p. 477, Gulf of Fonseca, El Salvador; Nicaragua (original description).

Achirus fimbriatus MEEK and HILDEBRAND, 1928, p. 1001, pl. 102, fig. 1, Panama Bay (synonymy; description; range).

Head 3.4; depth 1.65; D. 54; A. 34; scales about 75.

Body ovate, anteriorly broadly rounded; head short, deep; caudal peduncle very short, deep, 2.0 in head; snout short, broadly convex, its length in advance of lower eye 3.7; eyes very small, about equally advanced (the upper in advance of lower one in a larger specimen from Panama Bay), about a third length of snout, and 10 in head; interorbital about equal to diameter of eye; mouth small, slightly inferior, its angle about under anterior margin of lower eye; jaws curved; lips fringed, the upper one overhanging gape; teeth not evident, lateral line about equally developed on both sides, with an indistinct vertical branch anteriorly; scales small, difficult to enumerate accurately, ctenoid on both sides, missing on most of opercle on blind side, four enlarged series over head, one on margin of body and three on base of dorsal rays, extending forward on snout and on the rays of fins, some scales with minute hairlike cirri; first ray of dorsal on anterior margin of head, its longest rays about as long as head without snout, caudal rounded, as long as head; anal and ventral of ocular side connected, the membrane between last ray of ventral and the first of anal a little wider than the other interradial membranes, first ray of anal a little behind vertical from margin of opercle; ventral of blind side very close to that of ocular side and parallel with it, each with five rays.

Color brownish, with many pale markings, consisting of curved and irregular lines, circles, and spots; fins brownish at base, lighter distally.

The description is based on a small specimen 46 mm. (35 mm. to base of caudal) long, dredged in shallow water in Guayaquil Bay, off Puerto Pizarro, by the Mission. This species is now recorded from Peru for the first time. The specimen described was compared with the original description and with a redescription of the type by Chabanaud (1928, p. 18), as well as with a larger specimen from Panama Bay. The discrepancies, such as the narrower interorbital, the almost equally advanced eyes, the fewer hairlike cirri, and the light color in less definite spots probably may be ascribed to the extreme youth of the Peruvian specimen. The Panama specimen (70 mm. long), though not so large as the type (81 mm. long, according to Chabanaud), has a wider interorbital, the upper eye is well in advance of the lower, the dermal cirri are much longer and more numerous, and the light color is more definitely concentrated in spots. It possesses a blunt spine, placed just above upper lip on ocular side, possibly a male character, which the Peruvian fish does not have. The following proportions and enumerations are based on the Panama example: Head in length 3.5; depth 1.6. Eye in head 13; snout 3.0; interorbital 15; caudal peduncle 1.9. D. 50; A. 35; scales about 73. This species is known only from the 3 specimens mentioned.

Range.—El Salvador to northern Peru. Previously known from only as far south as Panama Bay.

Family CYNOGLOSSIDAE: Tonguefishes

Body elongate; eyes small, very close together, on left side; preopercle without free margin, being hidden by skin and scales; caudal fin fully united with dorsal and anal fins; pectorals wanting; ventrals, if present, free from anal.

Genus SYMPHURUS Rafinesque, 1810

Body rather elongate, more or less lanceolate, the depth being contained more than three times in the length; mouth rather small; teeth small, in a band in each jaw on blind side; gill opening rather small, the membranes united below, free from the isthmus, but adnate to shoulder girdle above; lateral line wanting; scales ctenoid; pectoral fins wanting in adults; one ventral fin present, well separated from the anal, median in position.

Three species are recorded herein from Peru, two of them being new to science. In identifying the Peruvian material, it has seemed necessary to examine virtually all the specimens of the genus from the Pacific coast of America included in the collection of the U. S. National Museum. The material examined included specimens of all the species known from the Pacific coast of America, exclusive of *fasciolaris* Gilbert and *melanurus* Clark. A key to all the species is included, which is intended to show especially wherein the new species described differ from the others. Furthermore, nearly all the species may be expected in Peru.

Because of the soft margins of the snout and opercle and the indefinite outline of the orbits, the measurements of the snout, eye, and maxillary are rather indefinite and accordingly are not used in the key. In enumerating scales the oblique series running upward and backward, between the upper anterior angle of opercle and base of caudal, were counted.

KEY TO THE SPECIES

a. Mouth rather large, the maxillary reaching nearly or quite to, or even beyond, posterior margin of lower eye; body usually rather elongate, the depth being contained about 3.4 to 4.5 in length.

b. Body very elongate, the depth 4.3 to 4.5 in length; mouth large, the maxillary reaching beyond posterior margin of eye; teeth minute, missing on posterior fourth or so of both jaws on ocular side; dorsal with 100 to 105 rays; anal with 83 to 86; scales 87 to 92; body uniform brown (very young with dark cross bars); caudal, and dorsal and anal posteriorly, uniform dusky .... **elongatus**

bb. Body generally deeper, the depth about 3.6 to 4.1 in length; mouth smaller, the maxillary reaching nearly or quite to posterior margin of eye; dorsal with 88 to 98 rays; anal with 73 to 81.

c. Body moderately elongate, the depth 3.9 to 4.1 in length; snout not projecting beyond mouth; teeth minute, missing on posterior fourth or so of both jaws on ocular side; dorsal with 88 to 93 rays; anal with 70 to 74; scales 82 to 87; body brownish, with somewhat indefinite cross bars; caudal and posterior parts of dorsal and anal uniformly black. **leei**

cc. Body deeper, the depth 3.4 to 3.7 in length; snout distinctly projecting in advance of mouth; teeth in jaws very weak, missing on posterior three-fourths or so of both jaws on ocular side; dorsal with 94 to 98 rays; anal with 77 to 81; scales 84 to 89; body plain brownish; caudal and posterior or so of dorsal and anal uniform dusky. **sechurae**, new species (p. 475) *aa.* Mouth smaller, the maxillary failing to reach beyond the middle of lower eye; body usually deeper, the depth being contained about 3.25 to 4.1 in length.

d. Body becoming rather abruptly narrower posteriorly (not checked for *fasciolaris*); scales 90 to 100; teeth fairly prominent on blind side, missing on posterior half or so on jaws of ocular side (not checked for *fasciolaris*).

e. Dorsal with 94 rays; anal with 77; depth 3.4 in length; scales 95; body light olive, with numerous roundish brown-black spots larger than eyes; dorsal and anal posteriorly black; caudal jet-black, with white edge. **fasciolaris**

ee. Dorsal with 89 to 90 rays; body brownish, not definitely spotted, often with dark areas or with indefinite dark cross bars; caudal not jet-black.

f. Anal with 78 to 80 rays; scales 97 to 100; body brownish, some specimens with indications of cross bars; caudal, and posterior part of dorsal and anal, uniformly dusky________________________________ **atricaudus**

ff. Anal with 71 to 78 rays; scales 90 to 96; body brownish, with dark areas or cross bars; dorsal and anal posteriorly with black spots. **atramentatus** (p. 477)

dd. Body tapering gradually posteriorly; scales larger, 77 to 89.

g. Dorsal with 92 to 95 rays; scales 77 to 80; depth 3.6 to 3.8 in length; color grayish brown, many scales with dark centers, dorsal and anal not notably darker posteriorly than anteriorly_**paitensis**, new species (p. 478)

gg. Dorsal with 100 rays; scales 89; depth 3.22 in length; general color uniform brown, dorsal and anal pale anteriorly, dark to nearly black posteriorly____**melanurus**

SYMPHURUS SECHURAE, new species

FIGURE 89

Head 4.9 to 5.6; depth 3.4 to 3.7; D. 94 to 98; A. 77 to 81; scales 84 to 89.

Body moderately deep, tapering rather gradually posteriorly; head small, its dorsal outline broadly convex; snout projecting in advance of mouth, 4.5 to 5.2 in head; eyes small, the upper one well in advance of the lower, in contact with each other, 9.0 to 14 in head; mouth rather large, the jaws curved, the soft tip of snout overhanging the gape anteriorly; maxillary reaching nearly or quite to posterior margin of eye, 3.6 to 4.8 in head; teeth minute, in a rather broad band in each jaw on blind side, reduced to a single feeble series anteriorly on ocular side, missing on posterior three-fourths or so, of each jaw on this side; scales quite small, strongly ctenoid on both sides, some of the serrae at middle of each scale often enlarged, scales extending forward on head, nearly, but not quite, to its anterior margin on ocular side, outlined but not ossified on snout and around the mouth on blind side, 22 or 23 oblique series of scales between lower eye and indentation in margin of opercle; dorsal fin of nearly uniform height throughout, its longest rays about as long as snout and lower eye, its first ray over anterior part of upper eye; caudal fin moderately pointed, about half length of head; anal similar to dorsal, its first ray about length of snout behind margin of opercle; ventral median, at isthmus, removed from anal a distance about equal to length of snout.

Color plain brown or with indefinite pale dots in small example; opercular region a little darker than rest of body; dorsal and anal nearly colorless anteriorly, becoming dusky gradually, and quite dark posteriorly, with pale margin; caudal dark, like posterior parts of dorsal and anal, with a white distal margin.

This apparently new species is represented in the collection furnished by the Mission by 4 specimens, 70 to 115 mm. (64 to 102 mm. to base of caudal) long, dredged in Sechura Bay, near Sechura. Next to the largest one (U.S.N.M. No. 128170), which is 110 mm. (98 mm. to base of caudal) long, has been selected as the type, and the following proportions and enumerations apply to that specimen: Head 5.2 in length; depth 3.4. Eye in head 10; snout 4.5; maxillary 3.6. D. 98; A. 77; scales 89, oblique series between lower eye and indentation in opercular margin 22.

In addition to the specimens from Peru, herein described, a specimen (U.S.N.M. No. 88832), 163 mm. long, from Guayaquil, Ecuador, another (U.S.N.M. No. 50333), 233 mm. long, from Panama Bay, and two (U.S.N.M. No. 126741), 132 and 140 mm. long, from the Gulf of California (lat. 30° N., long. 144° W.), also seem to belong to this species. The largest specimen has dark lines along the rows of scales, which are faintly visible also in next to the largest one, though not in the others, and it has 89 rays in the anal, which is 8 rays more than are found in any other specimen. In other respects it is in agreement with the rest of the material studied and accordingly may at least tentatively be placed with the present species.

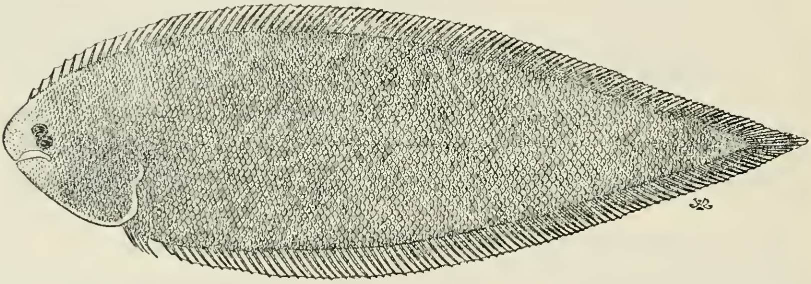

Figure 89.—*Symphurus sechurae*, new species. From the type, 110 mm. long, Sechura Bay, Peru (U.S.N.M. No. 128170).

This species differs from the other two local ones herein described in the larger mouth, with the maxillary extending nearly or quite to posterior margin of lower eye, and in the uniform dark color of the posterior parts of the dorsal and anal fins. Other differences are shown in the key to the species. It differs from *S. elongatus* (Günther), a species occurring in Panama Bay, in having a notably deeper body, a somewhat smaller mouth, and weaker dentition. From *S. leei* Jordan and Bollman, another species inhabiting Panama Bay, it differs in being deeper, with weaker dentition, and with the snout projecting beyond the mouth, which it does not do in *leei.*

Range.—Northern Peru, and apparently northward to the Gulf of California.

SYMPHURUS ATRAMENTATUS Jordan and Bollman

Symphurus atramentatus JORDAN and BOLLMAN, 1890, p. 177, Panama Bay, at latitude 7°57′ N., longitude 78°55′ W. (original description; compared with *S. atricaudus* (Jordan and Gilbert)).—REGAN, 1913, p. 280, Lobos de Tierra, Peru.—MEEK and HILDEBRAND, 1928, p. 1008, Panama Bay (references; description; range).

Head 4.2 to 4.7; depth 3.2 to 3.9; D. 86 to 90; A. 71 to 78; scales 90 to 96; vertebrae (in an example from the Gulf of California) 52.

Body fairly deep, becoming rather abruptly narrower posteriorly; head small, its dorsal outline broadly convex, especially in adults; snout projecting in advance of mouth, 4.6 to 6.0 in head; eyes small, the upper one a little in advance of the lower, virtually in contact with each other, 6.2 to 9.5 in head; mouth rather small, the jaws somewhat curved, the soft tip of snout forming a sort of hook, overhanging the gape anteriorly; maxillary reaching nearly or quite to middle of eye, 4.0 to 4.7 in head; teeth in jaws very small, in a definite band in each jaw on blind side, reduced to a single series anteriorly and missing on posterior half of jaws on ocular side; scales quite small, strongly ctenoid on both sides, some of the serrae at middle of scale enlarged, extending forward on snout and to some extent on eyeballs on ocular side, becoming modified into cutaneous flaps or papillae on snout on blind side, covering also the median ridge, 19 or 20 oblique series of scales between lower eye and indentation in margin of opercle; dorsal fin of nearly uniform height, its longest rays generally somewhat exceeding length of snout and lower eye, its first ray almost directly over middle of upper eye; caudal moderately pointed; anal similar to dorsal, its first ray about an eye's diameter behind margin of opercle; ventral median, at isthmus, removed from anal a distance rather less than length of snout.

General color brownish; small specimens with partial cross bars, larger specimens with dark blotches under dorsal and anal fins, large specimens tending to become plain or with indefinite dark areas; dorsal and anal pale anteriorly, becoming brownish posteriorly, each fin with black spots generally confined to posterior parts of these fins, though sometimes more or less developed on nearly full length of fins; caudal dusky, with pale tip; ventral pale.

Three small specimens, about 45 mm. (tail partly missing), 54, and 82 mm. long, were collected in 14 to 16 fathoms by W. L. Schmitt, off Lobos de Afuera Island. As these specimens are so small that accurate enumerations of scales and fin rays are difficult, large specimens, up to 127 mm. in length, from Panama Bay (including two paratypes) and the Gulf of California, also were used in preparing the description. This species was reported from 5 to 8 fathoms from Lobos de Tierra Island by Regan (see reference above), which is the only previous record from Peru. A small specimen from north of Octavo Rocks, Colombia, and several from the Galápagos Islands also were examined. This species probably does not occur immediately along the shore in very shallow water. One lot from Panama Bay (lat. 77°33′40″ N., long. 79°43′20″ W.) was taken at a depth of 153 fathoms. The largest specimen seen is 130 mm. long.

Range.—Gulf of California to northern Peru and the Galápagos Islands.

SYMPHURUS PAITENSIS, new species

Figure 90

Head 5.5, 5.4; depth 3.8, 3.6; D. 92, 95; A. 75, 75; scales 80, 77.

Body moderately slender, tapering gradually posteriorly; head small, its dorsal outline broadly convex; snout projecting slightly beyond mouth, 5.1, 5.25 (measured to lower eye) in head; eyes moderate, the upper well in advance of the lower, in contact with each other, 7.75, 7.5 in head; mouth small, the jaws curved, the tip of snout hooklike, overhanging the gape anteriorly; maxillary scarcely reaching middle of eye, 4.15, 4.2 in head; teeth minute, in a band in each jaw on blind side, reduced to a single, very feeble series anteriorly on ocular side, missing on posterior three-fourths of each jaw on this side; scales moderately large, very strongly ctenoid on both sides, extending forward to margin of snout on both sides, and to some extent on eyeballs, 18 oblique series of scales between lower eye and indentation in margin of opercle; dorsal fin of nearly uniform height throughout, its longest rays a little shorter than snout and lower eye, its first ray over posterior half of upper eye; caudal fin pointed, about half length of head; anal similar to dorsal, its first ray behind margin of opercle a distance somewhat exceeding length of snout; ventral median, inserted at isthmus, removed from anal a distance equal to snout and half the lower eye.

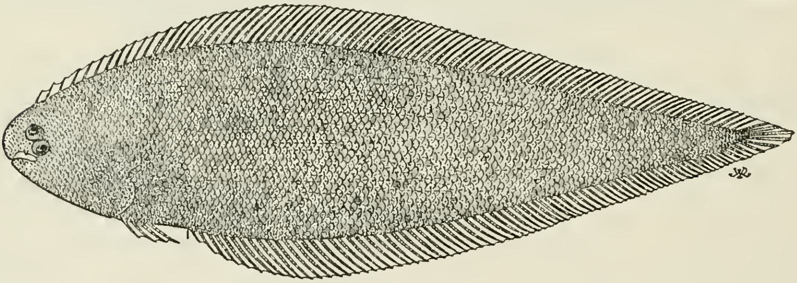

Figure 90.—*Symphurus paitensis*, new species. From the type, 100 mm. long, Paita Harbor, Peru (U.S.N.M. No. 128172).

Color grayish brown, the smaller specimen with irregular light spots; opercular region darker than rest of fish; many scales with dusky centers; each ray of dorsal and anal dusky in the larger specimen, three or four rays darker with about an equal number of lighter rays between in the smaller specimen; caudal slightly dusky, with suggestions of darker cross markings in the larger specimen; pale, with an elongate dark area in center, in the smaller one.

This apparently new species is represented by two specimens, 100 and 45 mm. (91 and 40 mm. to base of caudal) long, in the collection furnished by the Mission. The larger one (U.S.N.M. No. 128172), which was dredged in Paita Harbor, on muddy bottom in about 5 fathoms, has been designated as the type. The proportions and enumerations given first in the description apply to this specimen. The smaller example, which differs somewhat from the larger one in color only, was taken with an otter trawl in Sechura Bay.

The smaller mouth and larger scales distinguish this species from *S. sechurae*. The large scales also help to distinguish this species from *S. atramentatus* and from the other forms from the Pacific coast of America. Its grayish-brown color, and the fairly uniform color throughout the dorsal and anal fins also are fairly distinctive.

Range.—Known only from the type material from Paita Bay and Sechura Bay, Peru.

Family ECHENEIDAE: Remoras

Body moderately elongate to slender; head depressed above, its upper surface provided with an oval disk consisting of a variable number of crosswise partitions or laminae and a single median lengthwise septum; mouth large; lower jaw projecting; teeth small pointed, in bands on jaws, vomer, palatines, and usually on tongue; gill membranes free from isthmus; gills four; branchiostegals seven; scales minute; dorsal and anal fins long and low; ventral fins thoracic; pectorals inserted high on side.

The remoras are widely distributed in warm seas and usually are found adhering to large fish or turtles by means of the disk on the head. A single genus has been reported from Peru.

Genus REMORA Gill, 1863

Body rather robust; disk relatively short, with 13 to 18 laminae; soft dorsal with 22 to 32 rays; anal with 22 to 30; caudal with straight to slightly concave margin; pectoral short, rounded.

Two species have been reported from Peru.

KEY TO THE SPECIES

a. Disk with about 18 laminae; dorsal with about 23 soft rays; anal with 25 ---------- **remora** (p. 480)

aa. Disk with about 12 laminae; dorsal with about 17 soft rays; anal with 20 ---------- **clypeata** (p. 480)

REMORA REMORA (Linnaeus)

Echeneis remora Linnaeus, 1758, p. 260, "in Pelago Indico" (diagnosis).
Remora remora Regan, 1913, p. 280, Lobos de Tierra, Peru.—Meek and Hildebrand, 1928, p. 898 (synonymy; description; range).

No specimens are included in the collections studied. The species has been reported from Peru by Regan (see reference above) from a single specimen attached to "a large ray" captured at Lobos de Tierra. A diagnosis is included in the preceding key.

Range.—Warm seas.

REMORA CLYPEATA (Günther)

Echeneis clypeata Günther, 1860, p. 401, "Cape Seas" (original description); 1861, p. 376, "Cape Seas" (reference; description; discussion of relationship with *albescens* Temminck and Schlegel).
Remora clypeata Regan, 1913, p. 280, Lobos de Tierra, Peru.

No specimens are included in the collections studied. The species has been reported from Peru by Regan (see reference above), from two examples attached to "a large ray" with the one of the preceding species. A diagnosis is included in the foregoing key. Barnard (1927, p. 421) synonymized *R. clypeata* with *R. albescens* (Temminck and Schlegel).

Range.—South Africa and South America (Peru) and, if identified with *R. albescens*, Indo-Pacific to Baja California and Peru.

Family BALISTIDAE: Triggerfishes

Body ovate to somewhat elongate, considerably compressed; snout long; eye placed high; mouth small, usually terminal; jaws strong; teeth in a single series, incisorlike to more or less conical; gill openings reduced to mere slits; skin leathery, covered with more or less platelike scales, bearing spines or bony tubercles; dorsal fins two, the first composed of two or three spines, the first one large, locked when erect by the ball of the second one slipping into a socket under base of the first (forming a trigger); second dorsal well separated from the first, with rather numerous soft rays, similar to anal; ventral fins replaced by a single stout median spine, attached to an enlarged pelvic bone.

Two genera have been reported from Peru.

KEY TO THE GENERA

a. Gill slit followed by several enlarged bony plates------- **Balistes** (p. 480)
aa. Gill slit surrounded by ordinary scales, not followed by enlarged bony plates. **Canthidermis** (p. 482)

Genus BALISTES Linnaeus, 1758

Body deep, compressed; snout long, generally pointed; eye small, placed near upper outline of head; teeth in jaws large, irregular, usually notched; gill opening an oblique slit, followed by enlarged bony scutes or plates; lateral line often obsolete, undulating if present; scales platelike, rough, usually bearing spinules; first dorsal with three spines, the first one much enlarged; second dorsal and anal long, similar, placed more or less opposite each other.

A single species is known from Peru.

BALISTES POLYLEPIS Steindachner

PEJE-CHANCHO; COCHINO

FIGURE 91

Balistes polylepis STEINDACHNER, 1876, p. 21, Magdalena Bay, Mazatlán, and Acapulco, Mexico (original description).—EVERMANN and RADCLIFFE, 1917, p. 131, pl. 12, fig. 2, Lobos de Afuera, Peru (references; description; compared with *B. naufragium* Jordan and Starks).—NICHOLS and MURPHY, 1922, p. 511, Lobos de Tierra Island, Peru.—MEEK and HILDEBRAND, 1928, p. 790, Panama Bay (references; description; range).

Head (to upper angle of gill slit) 2.8, 3.0; depth (at vertical from second dorsal spine) 1.6, 1.8; D. III–26, III–26; A. 23, 24; P. 13, 13; scales (series running upward and backward between gill slit and base of caudal, in a large specimen) 70.

Body deep, compressed, its greatest thickness about a third of its depth; ventral profile anteriorly more strongly convex than the dorsal; caudal peduncle rather short and slender, 2.8, 3.8 in head; snout long, 1.6, 1.3; eye small, 3.5, 5.8; preorbital groove well developed; interorbital 3.1, 3.25; mouth small, terminal; lips moderately thin; teeth strong, anterior pair largest, each tooth with a more or less definite posterior cusp; lateral line not evident in the specimens at hand (irregular and branched in some of the Panama material, not always visible); scales rougher in young than in adult, extending forward nearly to the lips, leaving no marked naked area about the mouth, forming a sheath at bases of second dorsal and anal; first dorsal spine quite long and strong, inserted immediately behind vertical from posterior margin of eye, 1.2, 1.5 in head, the other two spines small; second dorsal with convex margin in young, notably elevated anteriorly in adult; caudal round in young, deeply concave, with the outer rays much produced in adult; anal similar to second dorsal, its origin a little posterior to that of second dorsal; pectoral short, rounded, 2.4, 2.1 in head; ventral spine short and broad, provided with rather prominent lateral spines, the folds of skin behind it with barbs.

Color uniform brown or grayish brown; lower parts somewhat lighter than the back; membranes of spinous dorsal dusky, other fins about same color as body in adult, plain translucent in young.

The collection furnished by the Mission contains one small specimen, 53 mm. (42 mm. to base of caudal) long, taken in Sechura Bay. Evermann and Radcliffe (see reference above) reported a large one, now 440 mm. (315 mm. to base of caudal) long, collected at Lobos de Afuera by R. E. Coker. These two specimens apparently are the only ones known from Peru, and form the basis for the foregoing description. The shape of the second dorsal, caudal, and anal fins change greatly with age, as indicated in the description, and as shown by other specimens from Panama Bay. It is evident, also, from the Panama material that these fins are not always uniformly developed in specimens of equal size.

Although the Peruvian examples herein have been identified with northern material (chiefly from Panama Bay), differences in the number of fin rays of the limited material now at hand indicate that they probably are subspecifically distinct. The second dorsal has 26 rays in each of the Peruvian examples, whereas in 19 specimens from Panama Bay 3 have 26 rays, 12 have 27, and 4 have 28. The anal has 23 rays in 1 of the Peruvian specimens and 24 in the other, while in the 19 specimens from Panama Bay it has 23 rays in 1 specimen, 24 rays in 2 examples, 25 in 14, and 26 in 2. The pectoral has 13 rays in each Peruvian example, compared with 13 rays in 2 examples, 14 in 16, and 15 in 1 specimen from Panama Bay.

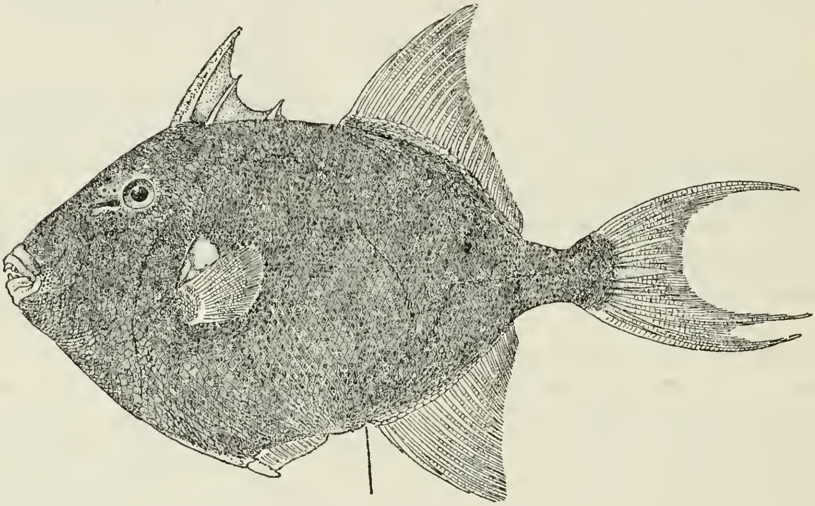

Figure 91.—*Balistes polylepis* Steindachner. From a specimen 450 mm. long with a slightly abnormal caudal fin, Lobos de Afuera Island, Peru (U.S.N.M. No. 77679). (After Evermann and Radcliffe, 1917.)

Range.—Baja California to northern Peru.

Genus CANTHIDERMIS Swainson, 1839

Body somewhat elongate, compressed; snout long, rather blunt; teeth strong, generally notched; gill opening an oblique slit, surrounded by ordinary scales (with no enlarged bony scutes behind it as in

Balistes); first dorsal with three spines, the first much enlarged; second dorsal and anal long, without spines, similar, and placed more or less opposite each other.

A single species has been recorded from Peru.

CANTHIDERMIS ADSPERSUS (Tschudi)

Balistes adspersus Tschudi, 1845, p. 31, Huacho, Peru (original description).—Abbott, 1899, p. 360 (original description quoted, without additional information).

Canthidermis adspersus Evermann and Radcliffe, 1917, p. 131 (synonymy; discussion of relationship).

Canthidermis rotundatus Meek and Hildebrand, 1928, p. 794, Panama Bay (synonymy, based on the assumption that the Panama specimens are identical with Hawaiian and Japanese specimens, which may be correct; description, based on small specimens; range).

Head (to upper angle of gill slit) 2.33 to 2.7; depth (at vertical from second dorsal spine) 1.5 to 1.8; D. III–22 to 24; A. 20 to 22; P. 14; scales (series running upward and backward between gill slit and base of caudal) 41 to 46.

Body deep, compressed, its greatest thickness rather more than a third its depth; ventral profile anteriorly notably more strongly convex than the dorsal; caudal peduncle short, 2.7 to 3.1 in head; snout long, moderately blunt, 1.8 to 2.2; eye small 2.8 to 4.8; preorbital groove short, little developed; interorbital expanded, transversely flat or concave, 2.2 to 2.6; mouth very small, terminal; lips fairly thin, with folds; teeth broad, with a more or less distinct lateral cusp; lateral line not evident; scales very rough, many on side with an enlarged spine, extending forward to lips, forming a shield of three or four longitudinal rows on bases of second dorsal and anal; first dorsal spine strong, with four rows of strong spines on its anterior surface, inserted nearly an eye's diameter behind vertical from posterior margin of orbit, 1.9 to 2.4 in head, the other spines short and slender; second dorsal with convex margin, the longest rays of about the same length as the first spine; caudal rounded; anal similar to second dorsal, its origin well posterior to that of second dorsal; pectoral short, rounded, upper rays longest, 2.75 to 3.0 in head; ventral spine short, very spinous, followed by prominent spinules on median line of abdomen.

Color dark brown to grayish; usually everywhere with pale spots (probably juvenile markings); pectoral plain translucent, the other fins rather darker than body and without light spots in the larger specimens, paler and spotted to colorless in the juveniles.

Although this species originally was described from Peru, it has not been secured there by recent collectors. The description is based on 17 small specimens, 16 to 72 mm. (12 to 60 mm. to base of caudal) long, from Panama Bay, the same ones, at least in part, on which the description of *C. rotundatus* Meek and Hildebrand (see reference above), was based. These authors regarded the Panama material as identical with specimens from Japan, which may be correct. However, there are insufficient specimens available for study to prove it. Accordingly it seems advisable to retain provisionally *adspersus* of Tschudi for the American representatives. As the specimen described by Tschudi was about 250 mm. long, whereas the largest one now at hand is only 72 mm. in length, there naturally are some disagreements, though apparently none that cannot be ascribed to age. The same remarks apply to a specimen 360 mm. long, from Cocos Island, described by Snodgrass and Heller (1905, p. 407) as *C. angulosus*.

Range.—Panama Bay, Cocos Island, and Peru.

Family TETRAODONTIDAE: Puffers

Body oblong, robust; belly capable of great inflation either with air or water; head large; mouth small, terminal; teeth fused into a plate, in each jaw, each plate with a median suture; gill opening reduced to a slit situated immediately in front of pectoral; true scales usually absent, the skin often being covered with spinules or prickles, most commonly present on back and belly; dorsal fin single, inserted posteriorly, consisting of soft rays only; anal similar to dorsal, and generally more or less opposite it; ventral fins wanting; pectorals short and broad.

The puffers are sluggish shore forms of the warmer seas. A single genus is known to occur in Peru.

Genus SPHOEROIDES Lacepède, 1798

Body oblong, plump, capable of considerable inflation; nostril with a short transverse tube with a small opening at each end, inside of tube smooth or with folds of skin; skin largely smooth to partly or almost wholly covered with prickles, sometimes with scalelike dermal development, and occasionally with dermal flaps; dorsal and anal similar, small, each with about six to eight rays; caudal usually with a straight or convex margin, rarely concave.

Two species are included in the Peruvian collections studied, one of which apparently is new to science.

KEY TO THE SPECIES

a. Spinules wanting on snout and posterior to origin of dorsal and of anal, and along middle of side; pectoral with 16 rays---------- **annulatus** (p. 485)

aa. Spinules present almost everywhere, extending forward on snout and on tail behind dorsal and anal fins; pectoral with 14 or 15 rays.
sechurae, new species (p. 486)

SPHOEROIDES ANNULATUS (Jenyns)

TAMBORÍN

Tetrodon annulatus JENYNS, 1842, p. 153, Chatham Island, Galápagos Archipelago (original description).

Spheroides annulatus EVERMANN and RADCLIFFE, 1917, p. 132, Paita and Tumbes, Peru (synonymy; description; range).

Sphoeroides annulatus MEEK and HILDEBRAND, 1928, p. 816, pl. 78, fig. 1, Panama Bay (synonymy; description; range).

Head 2.7 to 2.9; depth at vertical from base of pectoral about 3.3 to 3.9; D. 8; A. 7; P. 16.

Body rather robust, its width and depth about equal at base of pectoral; head large, its width and depth about equal at eyes, its dorsal profile convex; caudal peduncle compressed, 3.05 to 3.2 in head; snout long, blunt, 1.5 to 1.9; eye very small, 6.4 to 7.4; interorbital broad, flat, 2.5 to 2.9; mouth mostly transverse; lower jaw included; teeth variable, the margin rather straight in both jaws, to decidedly produced anteriorly, rather well separated at median suture to very close together; lateral line branched anteriorly, forming a loop extending from near corner of mouth, passing between the nostril and eye, and vertically downward a short distance behind eye, this branch continuing across the main lateral line to lower lateral angle of head, the main line running rather high and following the general contour of the back to base of caudal, slightly undulating; small prickles, showing the two "roots" at base as short cross ridges, present on dorsal surface from interorbital to dorsal fin, the prickles much less evident in one specimen than in the others; prickles rather larger than those on back covering ventral surface from behind chin to vent; dorsal fin high, the anterior rays longest, 1.75 to 2.0 in head; caudal broadly convex, the upper lobe angulate, the lower one rounded; anal similar to dorsal, though a little smaller, inserted about under middle of dorsal, its longest ray 1.9 to 2.3 in head; pectoral broad, margin of upper two-thirds of fin nearly straight to slightly convex, the lower four or five rays notably shorter, the longest rays 2.1 to 2.3 in head, 5.8 to 6.4 in length.

Color dark brown above; pale underneath; a pale band across upper surface of snout at about midlength; another one across head just behind eyes, bent backward and downward to gill opening, a third one at nape, bent downward and backward behind base of pectoral, a fourth one just behind head, joined with lateral horizontal bands meeting at origin of dorsal; an ellipse on top of back inside the figure just described; the ellipse with a median forward projection extending to the first cross band in front of the ellipse; sides with many roundish dark spots, extending on back, but obscure in the darker areas; dorsal, anal, and pectoral fins pale; caudal dusky, becoming darker distally. The foregoing color description is based on the smallest specimen (200 mm. long) at hand. The larger ones agree in general, though the pale bands are less distinct, and in one specimen the ground color of the back is lighter.

The description is based on three specimens, respectively 200, 235, and 265 mm. (158, 187, and 205 mm. to base of caudal) long, collected in Paita Harbor and at Lobos de Tierra Island by the Mission. There also is at hand a specimen in rather bad condition, 220 mm. long, taken in the Tumbes River by R. E. Coker. This material was compared with several specimens from the Galápagos Islands, and with others from Panama Bay and the Gulf of California all identified as this species. Much variation was noticed in the size of the eye, in the width of the interorbital, in the size and shape of the dental plates, in the prominence of the prickles, and in color. However, no characters constant enough to be of specific value were discovered, though more specimens need to be studied critically before it can be stated definitely that specific differences do not exist.

Range.—Northern Peru, the Galápagos Islands, and probably northward to the Gulf of California.

SPHOEROIDES SECHURAE, new species

PÓNCOÑOL

FIGURE 92

?*Spheroides lobatus* NICHOLS and MURPHY (not of Steindachner, probably this species), 1922, p. 511, Lobos de Tierra Island, Peru.

Head 2.2 to 2.7; depth at vertical from base of pectoral 3.3 to 3.9, D. 8; A. 7; P. 14 or 15.

Body moderately robust, fully as wide as deep at base of pectoral; head quite large, its width and depth about equal at eyes, its dorsal profile gently convex; caudal peduncle depressed, 5.25 to 5.8 in head; snout moderately long, somewhat conical, 2.0 to 2.6; eye small, 5.25 to 8.0; interorbital flat, moderately broad, 5.8 to 7.0; mouth small, transverse, lower jaw included; dental plate in each jaw with horizontal striations as if built up in layers; lateral line not well marked, apparently beginning behind angle of mouth, running close under eye and high on back, but descending to middle of side under dorsal fin, no accessory branches evident on head; spinules present everywhere except around the mouth and a median area in advance of upper and lower ray of caudal, fewest and smallest on lower part of side behind about midbody length, largest on back and belly; no dermal flaps; dorsal fin only moderately high, first ray less than half length of second, third and fourth rays longest, 2.2 to 2.5 in head; caudal with nearly straight margin; anal small, its origin a little behind that of dorsal, its margin convex, middle rays longest, 2.4 to

2.8 in head; pectoral broad, margin of upper two-thirds of fin gently convex, the lower 4 or 5 rays rather notably shorter, the longest ones 2.1 to 2.5 in head.

Color dark brownish gray above, pale underneath; back with indistinct pale lines, the most evident ones consisting of one between anterior and one between posterior margins of eyes, and a third crossing line at nape, another line crossing back a little in advance of tips of pectorals, joining horizontal lines extending forward from origin of dorsal, sometimes visible; a small ellipse, within the figure formed by lines just mentioned, occasionally present; some specimens with two cross lines behind dorsal fin; a few specimens with a bar darker than the ground color, as broad as eye, extending across interorbital, more frequently merely with a dark spot above each eye; side, posterior to pectoral fin, usually with roundish black spots; dorsal grayish brown at base, the rest of fin plain translucent; basal third of caudal olivaceous, the rest of fin nearly black, with a pale margin; anal plain translucent; pectoral with a narrow dark bar at base, though not extending across a few of the lower rays, the rest of the fin plain translucent.

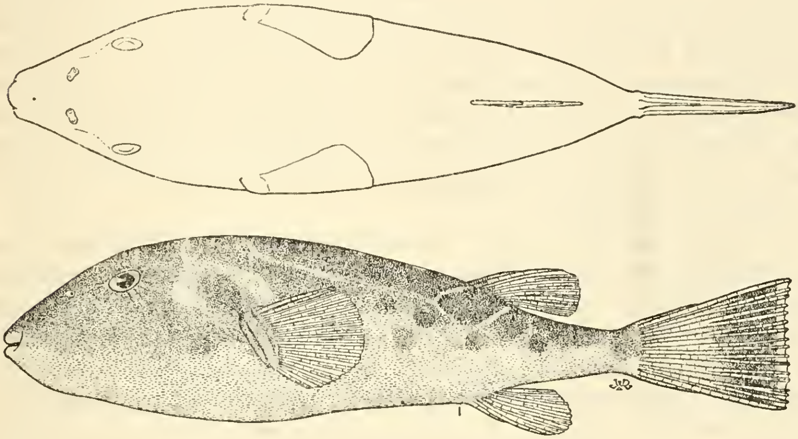

Figure 92.—*Sphoeroides sechurae*, new species. From the type, 68 mm. long, Sechura Bay, Peru (U.S.N.M. No. 128122).

This species is represented in the Peruvian collections studied by 31 small specimens, 37 to 73 mm. (29 to 58 mm. to base of caudal) long. One was taken off Paita by W. L. Schmitt; and the others were collected in Sechura Bay, and in Chimbote Bay by the Mission. There are at hand also three specimens, 70 to 85 mm. long, collected at Guayaquil, Ecuador, by Dr. Schmitt, which belong to this species. A few from the Gulf of California also seem to be of this species, including the largest specimen seen, which is 125 mm. long. The material now available suggests that the species may not grow large.

A specimen (U.S.N.M. No. 128122), 68 mm. (53 mm. to base of caudal) long, from Sechura Bay, has been selected as the type. The following proportions and enumerations are based on the type: Head 2.65 in length; depth at base of pectoral about 3.8; width of head at eyes 4.2; and pectoral 5.9. Eye in head 7.5; snout 1.95; interorbital 6.4; caudal peduncle 7.2; longest dorsal ray 2.1; longest anal ray 2.8; and longest pectoral ray 2.2. D. 8; A. 7; P. 15.

The specimens in the collection of the U. S. National Museum, which seem to be of this species, had been identified as *S. annulatus* or as *S. lobatus* (Steindachner). This species differs from *annulatus* in having a longer and slenderer head; in having nearly the entire body covered with spinules, whereas they do not extend forward beyond the interorbital or backward beyond the origin of dorsal in *annulatus;* and in having only 14 or 15 rays in the pectoral fin, while *annulatus* nearly always has 16. The light color markings described are much less distinct, and generally at least the body is less profusely spotted on the sides, and the pale margin of the caudal is much more conspicuous than in *annulatus*.

S. lobatus, to which some of the specimens of this species were assigned by different workers, was originally described and figured by Steindachner (1870, p. 18, pl. 5, fig. 3) as having no spinules on the snout and not extending nearly to origin of dorsal; the interorbital as narrow and concave; the profile as rising abruptly at the eyes; and the nostrils probably with a broad flap and without an opening, though owing to drying its exact nature could not be determined. There is now at hand a specimen (U.S.N.M. No. 101075), 60 mm. long, from the "west coast of Mexico," that has a nostril with a broad flap, without an opening; a narrow concave interorbital; with the spiny area on the back ending before origin of dorsal, though it does extend on the snout; and with 15 rays in the pectoral. This specimen, then, apparently may be identified as *lobatus*, whereas most if not all the examples, exclusive of the type, heretofore identified as this species were incorrectly determined. Unless the nostril is abnormal in the specimen now at hand, *lobatus* probably should be placed in a distinct genus according to modern classification. Except for the peculiar nostril, *lobatus* seems to be close to *S. angusticeps* (Jenyns).

S. sechurae apparently is nearest *S. angusticeps*, from which it differs in having a shorter head and a broader interorbital that is not concave; the dorsal profile does not ascend abruptly in front of eyes; and although the extent of the spinules covering the body is not very different in the young of the two species, *S. angusticeps* has flaps of skin, varying greatly in number and position among specimens along the side, and a rather constant pair at the shoulders, none of which are possessed by *S. sechurae*. In two specimens of the two species, each about 65 mm. long, the head is contained 2.3 times in the length, and the interorbital 13 times in the head or 5.9 times in the snout in *angusticeps*, whereas the head is contained 2.6 times in the length, and the interorbital 6.4 times in the head or 3.3 times in the snout in *sechurae*.

Range.—Gulf of California to northern Peru. No specimens from the Galápagos Islands or Panama Bay were seen.

Family GOBIESOCIDAE: Clingfishes

Body rather long, anteriorly broad and depressed; premaxillaries protractile; mouth moderate or rather small; teeth usually strong, the anterior ones conical or incisorlike; opercle reduced to a spinelike process, more or less concealed in the skin, and sometimes obsolete; gills 2½ or 3; gill membranes broadly united, free or united with the isthmus; scales wanting; dorsal and anal similar, at least partly opposite each other, consisting of soft rays only; ventral fins far apart, each with a concealed spine and four or five soft rays; a large sucking disk on chest, the ventrals forming a part of it.

The generic classification and the identification of the specimens, with the omission of trinomials, used in the preparation of the descriptions were furnished by L. P. Schultz, who studied the Peruvian material in the preparation of his recent paper on the American clingfishes (Schultz, 1944).

Three genera were recognized among the Peruvian specimens studied.

KEY TO THE GENERA

a. Each jaw anteriorly with incisors, either with smooth or indented cutting edges; dorsal and anal small; each with about 5 to 10 rays (visible without dissection).

  b. Incisors in part at least with 2 indentations, the middle pair often with smooth edges; opercular spine small, not projecting beyond membranous margin above it; origin of anal little behind that of dorsal. **Arbaciosa** (p. 489)

  bb. Incisors all with entire, and nearly straight cutting edges; opercular spine very large, projecting well beyond membranous margin above it; origin of anal behind middle of dorsal------------------- **Sicyases** (p. 491)

aa. Lower jaw anteriorly with somewhat compressed teeth with entire rounded or somewhat pointed cutting edges; teeth in upper jaw scarcely compressed, pointed, in 2 irregular series; dorsal and anal larger, the former with 11 to 15 and the latter with 10 to 13 rays (visible without dissection); origin of anal under anterior third of dorsal----------------- **Sicyogaster** (p. 493)

Genus ARBACIOSA Jordan and Evermann, 1896

Snout with a strongly convex anterior margin formed by the premaxillaries and lip; premaxillary groove slightly concave medianly; each jaw anteriorly with large incisors, the middle ones often with nearly straight cutting edges, the outside ones with two indentations, making them tricuspid, followed laterally by one to four conical teeth; opercular spine not long; gill membranes united, free from the isthmus, attached to shoulder in front of uppermost ray of pectoral; dorsal and anal small, the former with about 5 to 11 rays, and the latter with about 5 to 9 rays. (The numbers shown in the description include only the rays visible without dissection. Upon cutting the skin at the base of the fins 1 or 2 additional rays become visible.) The origin of the anal a little behind that of the dorsal.

A single species is known from Peru.

ARBACIOSA PYRRHOCINCLA (Cope)

Figure 93

Sicyases pyrrhocinclus Cope, 1877, p. 27, Peru, precise locality not stated (original description).

?*Gobiesox zebra* Regan (not of Jordan and Gilbert), 1913, p. 280, Lobos de Tierra, Peru.

Arbaciosa hieroglyphica Evermann and Radcliffe, 1917, p. 155, pl. 14, fig. 2, Lobos de Afuera, Peru (original description; compared with description of *A. pyrrhocincla*).—Nichols and Murphy, 1922, p. 513, Paracas Bay, Lobos de Afuera Island, Peru.

Arbaciosa pyrrhocincla pyrrhocincla Schultz, 1944, pp. 50, 59, Lobos de Afuera Island, Peru (diagnosis; synonymy; list of specimens examined).

Head (to tip of opercular spine) 3.1 to 3.3; depth 6.0 to 7.3; D. 7 or 8 A. 6 or 7; P. 18 to 20.

Head and body in front of vent depressed; tail compressed; head not quite so broad as long, its width 3.5 to 4.3 in length; caudal peduncle 3.4 to 4.6 in head; snout anteriorly rather strongly convex, 2.9 to 3.5; eye 4.5 to 6.2; interorbital broad, flat, without perceptibly raised orbital rims, 3.0 to 4.6; mouth small, its posterior angle well in advance of eye; width of premaxillaries with lip medially two-thirds diameter of eye; incisor teeth mostly at least with two notches in cutting edge, the middle pair broadest and often with smooth cutting edges, the upper series with eight and the lower with six incisors, followed laterally in each jaw by rather strong curved canine; the incisors sometimes in a double series, if so the outer ones rather shorter and prominently notched; anterior nostril with a very slightly raised margin, and a very small membranous flap behind it; dorsal with strongly convex margin, its longest rays a little longer than snout, its origin generally somewhat nearer vertical from tip of opercular spine than margin of caudal; distance from snout to dorsal 1.2 to 1.4 in length; distance from original or dorsal to base of caudal 3.6 to 4.1 in length; caudal with broadly convex margin, scarcely as long as head without snout; anal similar to dorsal, though somewhat smaller, its origin a little behind that of dorsal, and rather less than half as far from vent as from base of caudal, its base 2.1 to 2.5 in head; ventral disk moderately small, reaching little beyond tip of pectoral, shorter than head, 3.4 to 4.2 in length; pectoral short, with convex margin, 2.1 to 2.6 in head; a thickened area above base of lower rays of pectoral but not forming a flap with a free margin; a large membranous flap behind base of pectoral, attached below to ventral disk.

Color gray; back in some small specimens with dark cross blotches, narrowest on median line; other specimens plain, or dotted or spotted (as in the type and paratypes of *hieroglyphica*); a dark spot above base of pectoral usually present, the distance between the spots of the opposite sides fully as great as the space between the eyes; the markings most distinct in the light colored specimens.

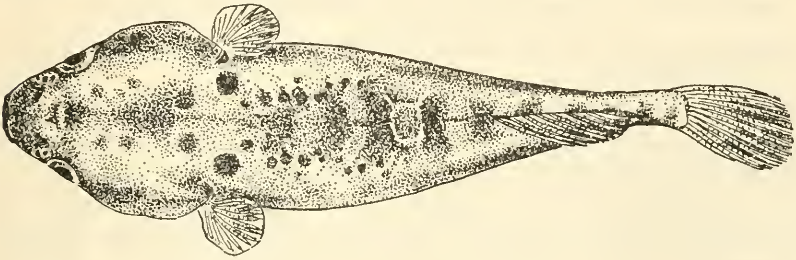

Figure 93.—*Arbaciosa pyrrhocincla* (Cope). From the type of *Arbaciosa hieroglyphica* Evermann and Radcliffe, 41 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 77561). (After Evermann and Radcliffe, 1917.)

This species is represented by 11 specimens taken by the Mission, 1 in Lobos de Afuera Bay and 10 at La Lagunilla; by the type (U.S.N.M. No. 77561) and 10 paratypes (U.S.N.M. No. 77565) of *hieroglyphica,* taken at Lobos de Afuera by R. E. Coker; and by several small specimens, also from Lobos de Afuera, collected by W. L. Schmitt. The proportions and enumerations used in the description are based on nine specimens (including the type and two paratypes of *hieroglyphica*), 35 to 49 mm. (29 to 40 mm. to base of caudal) long.

Range.—Coast of Peru.

Genus SICYASES Müller and Troschel, 1843

Snout with a strongly convex anterior margin, formed by the premaxillaries and lip; premaxillary groove broadly convex; each jaw anteriorly with large incisors, with entire and nearly straight cutting edges, followed laterally by several smaller pointed or blunt teeth; opercle with a long strong spine; projecting well beyond the membranous margin above it; gill membranes united, with a free margin extending across isthmus, attached to shoulder a little below level of uppermost ray of pectoral; dorsal and anal moderately small, the former with about 8 to 11 and the latter with about 6 to 9 rays (enumerations given in the following description are based on the rays visible without dissection); origin of anal well behind that of dorsal.

A single species has been recognized from Peruvian waters.

SICYASES SANGUINEUS Müller and Troschel

PEJE-SAPO

Sicyases sanguineus MÜLLER and TROSCHEL, *in* Müller, 1843a, p. 298, Chile (original description).—SCHULTZ, 1944, pp. 51, 61, Peru and Chile (diagnosis; synonymy; list of specimens examined).

Gobiesox sanguineus ABBOTT, 1899, p. 363, Callao, Peru (synonymy; color; number of dorsal and anal rays stated).—EVERMANN and RADCLIFFE, 1917, p. 153, Peru (synonymy; description).—NICHOLS and MURPHY, 1922, p. 513, Chincha Islands, Peru.—FOWLER, 1940b, p. 796, "Peru" and "Valparaiso."

Head (to tip of opercular spine) 2.3 to 2.9; depth 5.0 to 5.9; D. 9 or 10; A. 7; P. 24 or 25.

Head and body in front of vent depressed; tail compressed; head nearly as broad as long, its width 2.7 to 3.4 in length; caudal peduncle 4.25 to 5.3 in head; snout rather pointed, 3.0 to 3.3; eye 5.2 to 8.1; interorbital flat, except for slightly raised orbital rim, 2.4 to 3.0; mouth small, its posterior angle slightly in front of eye; width of premaxillaries with upper lip medianly equal to or wider than eye in large examples, about half width of eye in small ones; incisor teeth with smooth cutting edges, the upper with six and the lower with four (the outer pair sometimes missing, presumably broken) such teeth, the middle pair in each jaw largest; incisors in upper jaw followed laterally by a fairly large pointed tooth and by a small low pointed or blunt one; lower jaw laterally with a strongly pointed tooth, followed by a series of small ones; anterior nostril surrounded by a raised membrane, and a fringed membranous flap behind it; dorsal with convex margin, none of the rays much longer than snout; its origin somewhat nearer vertical from tip of opercular spine than from base of caudal; distance from snout to dorsal 1.4 to 1.6 in length; distance from origin of dorsal to base of caudal 2.6 to 3.1 in length; caudal with nearly straight margin, equal to or a little longer than postorbital part of head; anal similar to dorsal, though a little smaller, its origin under third last ray of dorsal, and about equidistant from base of caudal and vent, its base 2.5 to 3.2 in head; ventral disk large, extending nearly or quite to vent, fully as long as head, 2.3 to 2.9 in length; pectoral short and broad, with a broadly convex margin, the lower rays somewhat longer than the upper ones, 2.0 to 3.2 in head, preceded by a membranous flap at base, attached above at base of about the twelfth ray, also with a flap only a little smaller than the fin behind it, attached below to ventral disk.

Color largely faded; described by Evermann and Radcliffe (see reference above) as follows: "Color in spirits, coppery red to flesh-color, back crossed by six broad, dark reddish crossbands, the first on nape;

second behind pectorals; third in front of dorsal; fourth on base of dorsal; fifth on middle of caudal peduncle and sixth in front of base of caudal; fins yellowish, punctulate with dusky. This description is based on a specimen 11.5 cm. long."

This species was not taken by the Mission. The description, exclusive of the color, is based on six specimens from Peru, all without precise labels as to locality. Five 73 to 100 mm. (58 to 89 mm. to base of caudal) long, were taken by R. E. Coker, and the sixth, 195 mm. (160 mm. to base of caudal) long, is included in the collection of the Wilkes Exploring Expedition.

Range.—Coasts of Peru and Chile.

Genus SICYOGASTER Brisout, 1846

Snout with a rather broadly convex margin, formed by the premaxillaries and lip; premaxillary groove medianly nearly straight; teeth in upper jaw not definitely incisorlike, anteriorly in 2 irregular series; teeth in anterior part of lower jaw compressed, incisorlike, but with convex or somewhat pointed smooth cutting edges, projecting obliquely forward; opercular spine fairly short, not projecting beyond membranous margin above it; gill membranes united, with margin free from isthmus, attached to shoulder in front of uppermost ray of pectoral; dorsal and anal rather long, the former with about 11 to 16 rays, and the latter with about 10 to 14 (enumerations given in the following description include only the rays visible without dissection); origin of anal under anterior third of dorsal.

One species is known from Peru.

SICYOGASTER MARMORATUS (Jenyns)

Gobiesox marmoratus Jenyns, 1842, p. 140, pl. 27, figs. 1, 1a, and 1b, "Chiloe Archipelago," Chile (original description).

Sicyogaster marmoratus Schultz, 1944, pp. 53, 70, Peru and Chile (diagnosis; synonymy; list of specimens examined).

Head (to tip of opercular spine) 3.0; depth 5.2; D. 11; A. 9; P. 18.

Head and body anterior to vent much depressed; tail compressed; head nearly as broad as long, its width 3.1 in length; caudal peduncle slender, 4.25 in head; snout broadly convex, 2.7; eye 5.7; interorbital flat, without raised orbital rim, 2.8; mouth small, its posterior angle about under posterior nostril; premaxillaries with lip medianly about three-fourths diameter of eye; teeth in upper jaw not distinctly incisorlike, scarcely if at all broadened, rather small, unequal in size, irregularly in two series anteriorly, extending back nearly to angle of mouth; anterior teeth in lower jaw larger, definitely compressed, with smooth convex cutting edges, becoming smaller and more pointed laterally, extending to angle of mouth; anterior nostril with a low tube, ending in a simple or bifid tentacle on its posterior rim; dorsal with a broadly convex margin, the longest rays only a little longer than snout, its origin about an eye's diameter nearer vertical from tip of opercular spine than base of caudal, distance from snout to dorsal 1.6 in length; distance from origin of dorsal to base of caudal 2.75 in length; caudal moderately convex, about as long as postorbital part of head; anal similar to dorsal, though a little smaller, its origin under third ray of dorsal, and rather less than half as far from vent as from base of caudal, its base 1.5 in head; ventral disk rather large, not quite so long as head, 3.9 in length; pectoral short and broad, the lower rays longer than the upper ones and little shorter than the middle ones, lower three-fourths of margin nearly straight, 2.6 in head, preceded by a dermal flap, with a free margin attached above to base of seventh ray, also with a broad flap behind its base, attached below to ventral disk.

Color brownish above to olivaceous below; back with irregular, more or less broken cross bars; a pale line between and under eyes; an indefinite dark circle just below dorsal fin.

The description is based on the only specimen in the Peruvian collections in the U. S. National Museum. It was taken in Independencia Bay by W. L. Schmitt, and is 62 mm. (52 mm. to base of caudal) long.

Range.—Coasts of Peru and Chile.

Family BATRACHOIDIDAE: Toadfishes

Head, and usually anterior part of body, depressed; caudal portion compressed; head large; teeth usually strong; premaxillary protractile; gills three, a slit behind the last one; gill openings restricted to the sides, the membranes being broadly connected with the isthmus; branchiostegals usually six; suborbital without bony stay; scales small or wanting; first dorsal with two to four low, stiff spines; second dorsal long and low; ventral rather large, jugular, with one spine and two or three soft rays; pectoral broad at base.

Two genera are known from Peru.

KEY TO THE GENERA

a. Anterior part of body, at least, with 4 rows (lateral lines) of pores; vomer with a pair of canines on each side; opercular and dorsal spines all solid. **Aphos** (p. 494)

aa. Lateral line single; vomer with a series of teeth, but no canines; opercular and dorsal spines hollow______________________**Thalassophryne** (p. 497)

Genus APHOS Hubbs and Schultz, 1939

Body elongate; head depressed; lower jaw projecting; opercle with a large solid spine; subopercle without a spine; vomer with a pair of canines on each side; several rows of pores on head and body; no photophores; no scales; 2 dorsal spines; second dorsal and anal very long, each with about 30 to 34 rays; caudal free from dorsal and anal; pectoral long, more or less pointed, without foramen in axil.

A single species has been assigned to this genus.

APHOS POROSUS (Cuvier and Valenciennes)

FIGURE 94

Batrachus porosus CUVIER and VALENCIENNES, 1837, p. 506, Valparaiso, Chile (original description).

Porichthys afuerae EVERMANN and RADCLIFFE, 1917, p. 152, pl. 14, fig. 1, Lobos de Afuera, Peru (original description).

Aphos porosus HUBBS and SCHULTZ, 1939, p. 477, Peru and Chile (synonymy, *P. afuerae* Evermann and Radcliffe included; discussion).

Head 2.9 to 3.7; depth 5.2 to 6.2; D. II–31 to 33; A. 30 to 32; P. 19 or 20.

Body rather elongate, broader than deep at base of pectorals, strongly compressed posteriorly; head low, depressed, notably broader than deep, its anterior margin broadly convex; caudal peduncle slender, 5.5 to 8.0 in head; snout broad, 4.5 to 7.3; eye small, lateral in young, partly superior in adult, 5.4 to 6.4; interorbital flat, 3.7 to 7.4; mouth strongly oblique; lower jaw projecting, extending into dorsal profile; maxillary reaching nearly or quite under posterior margin of eye, 1.9 to 2.5 in head; teeth pointed, those of upper jaw very small, in a single series, those of lower jaw larger, especially laterally, indefinitely in two series anteriorly, laterally in a single series; teeth on vomer consisting of a pair of canines on each side, the outer one rather large; teeth on palatines unequal in size, in an irregular series; anterior nostril near median line of snout, with a short tube extending across premaxillary groove, the posterior one without a tube, situated in front of eye, on margin of premaxillary groove; four rows of pores on anterior part of body, the uppermost one extending from occiput to and along base of dorsal, the next one

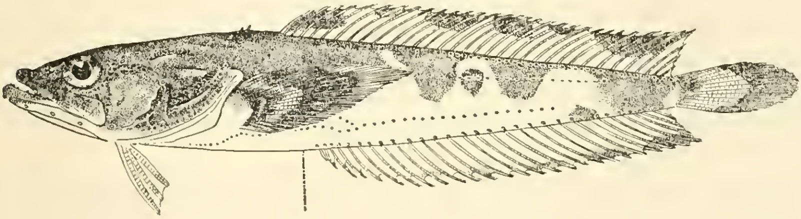

FIGURE 94.—*Aphos porosus* (Cuvier and Valenciennes). From the type of *Porichthys afuerae* Evermann and Radcliffe, 126 mm. long, Lobos de Afuera Island, Peru (U.S.N.M. No. 77552). (After Evermann and Radcliffe, 1917.)

beginning approximately above base of opercular spine, becoming indefinite or ending somewhere near tip of pectoral, the third one beginning at median line of isthmus, running between bases of ventrals, then outward and upward along lower part of side, joined by a short branch originating behind base of pectoral, becoming indefinite and disappearing somewhere above base of anal, the lowermost series extending along base of anal; other series of pores on head consisting principally of a series along rim of snout, passing under eye and upward and downward to base of opercular spine, another short series beginning behind preopercle and extending nearly to upper anterior angle of gill opening, another series on mandible extending along margin of opercle, two rows on basal half of caudal fin (all lines subject to some variation among specimens); most of the pores with tentacles; dorsal fins well separated, the first with two stiff spines, the second spine the longer, about three-fourths diameter of eye, origin of fin over base of pectoral, its distance from margin of snout 3.3 to 3.8 in length; second dorsal long and low, extending nearly to base of caudal, none of the rays greatly exceeding width of interorbital; caudal about as long as postorbital part of head, with convex margin; anal fin similar to second dorsal, its origin a little behind that of second dorsal and extending to base of caudal, its base 1.6 to 1.8 in length; ventrals close together, inserted about half an eye's diameter behind posterior margin of maxillary, scarcely reaching base of pectoral, 2.0 to 2.5 in head; pectoral broad at base, more or less pointed, the middle rays longest, generally about as long as head, 3.5 to 4.4 in length.

Color brownish above; pale or silvery on side and below; head plain brown above; back with four or five dark saddles, most distinct in young, becoming obscure and disappearing with age; dorsal fin pale, with four to six conspicuous widely spaced dark spots on outer half or so of fin; caudal pale at base, distal half dark; anal pale, or posteriorly with one or two dark blotches on margin; pectoral pale, except for brownish base in young, developing brownish cross markings with age.

This species is represented by rather numerous specimens in the collections from Peru, mostly rather small. The proportions and enumerations used in the description are based on seven specimens 32 to 140 mm. (26 to 122 mm. to base of caudal) long. The Mission secured specimens in Samanco Bay, in Chilca Bay, and off Cañete. R. E. Coker took a specimen at Lobos de Afuera, which was made the type of *Porichthys afuerae* by Evermann and Radcliffe (see reference above); and W. L. Schmitt collected specimens at Lobos de Afuera Island, Callao, and in Independencia Bay.

Range.—Coasts of Peru and Chile.

Genus THALASSOPHRYNE Günther, 1861

Body elongate; head and usually anterior part of body depressed; mouth strongly oblique; lower jaw projecting; opercle with a strong hollow spine; preopercle without free margin and without spine; teeth conic or incisorlike, present on jaws, vomer, and palatines; lateral line single; scales wanting; dorsal with two hollow spines; pectoral broad, without a foramen in axil.

A single, apparently new, species occurs in the collections from Peru. The genus has not been reported heretofore from south of Panama Bay. Venom glands are situated at the base of the hollow spines of the opercle and the first dorsal, which serve as "hypodermic needles" for the injection of the poison.

THALASSOPHRYNE DEPRESSA, new species

Figure 95

Head 3.6; depth 5.1; D. II, 30; A. 28; P. 16.

Body elongate, notably broader than deep at base of pectoral, posteriorly strongly compressed; head low, depressed, much broader than deep, its width at preopercular margin 4.25 in length, its anterior margin broadly convex; caudal peduncle slender, 6.5 in head; snout short, broad, 6.7 in head; eyes very small, superior, 11 in head, 1.75 in interorbital space; interorbital space flat, 6.6 in head; mouth very strongly oblique; lower jaw projecting, extending into dorsal profile; maxillary reaching somewhat beyond posterior margin of eye, 2.2 in head; teeth pointed, in a very narrow band anteriorly in each jaw, those of lower jaw the larger; vomer and palatines with a single continuous series of rather strong teeth; anterior nostril near median line of snout, ending in a short tube extending across premaxillary groove, posterior nostril without a tube, situated in front of eye, and behind a short simple tentacle on margin of premaxillary groove; a single lateral line beginning above base of pectoral spine, curved upward and running along base of second dorsal to base of caudal, the membranous margins of groove slightly fringed; a short groove beginning under and in front of eye, ending about at upper anterior angle of preopercular margin, being joined at about midlength by a groove originating lower down on premaxillary groove; many pores on head, and also a series along upper part of side below lateral line groove, most distinct posteriorly; dorsal fins well separated, the first with two sharp spines of about equal length, 2.8 in head, origin of fin over base of upper rays of pectoral, its distance from margin of snout 4.0 in length; second dorsal long and low, of nearly uniform height, the posterior rays extending well beyond base of caudal, next to last one scarcely equal to width of interorbital and both eyes; caudal attached to dorsal and anal, as long as postorbital part of head, its margin asymmetrically convex, the lower rays being shorter than the upper ones; anal similar to dorsal and coterminal with it, its origin directly under that of dorsal, its base 1.6 in length; ventrals rather close together, inserted under preopercular margin, 2.2 in head; pectoral large, broad at base, pointed, the sixth ray from above longest, reaching base of sixth ray of anal, only a little shorter than head, 4.8 in length.

Color grayish above, this color appearing only as a narrow streak under posterior part of second dorsal, broader at base of caudal; uniform pale on sides and below; upper surface of head with pale dots; back and upper part of side anteriorly with rather large roundish pale spots; lateral line in a pale streak; spinous dorsal black; second dorsal pale, with a broad, dark margin; caudal pale, distally and upper margin in part dark; anal and ventral pale; pectoral pale, with dusky punctulations on base, and more scattered ones near midlength of upper rays.

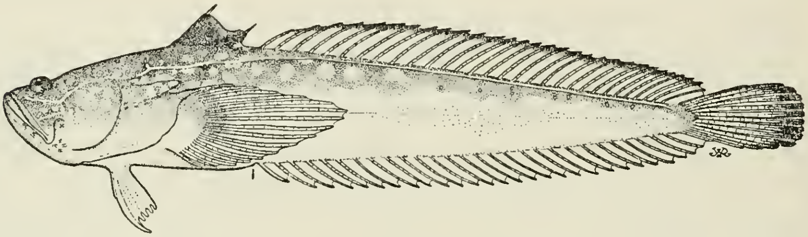

FIGURE 95.—*Thalassophryne depressa*, new species. From the type, 87 mm. long, Puerto Pizarro, Peru (U.S.N.M. 128235).

This apparently new species is represented in the collections studied by a single specimen (U.S.N.M. No. 128235), 87 mm. (72 mm. to base of caudal) long, dredged by the Mission in shallow water in the Gulf of Guayaquil at Puerto Pizarro. It is closely related to *T. dowi* Jordan and Gilbert from Costa Rica and Panama Bay but differs, according to the nine specimens from Panama Bay examined, which range in length from 103 to 157 mm., in several respects. The head is broader, its width at margin of preopercle being contained 4.25 times in the length, whereas this width is contained 4.9 to 5.6 times in the length in the Panama examples. The greater width of the head is reflected in the wider interorbital space, which is contained 6.6 times in the head in the small Peruvian example, and 6.8 to 8.25 in the larger Panama specimens. The difference is most pronounced in the specimens of nearest equal size, the extreme, 8.25, applying to the smallest specimen from Panama Bay. The Peruvian fish has 28 anal rays, whereas 4 specimens from Panama have 29, and 5 have 30 rays. In the Peruvian example the origin of the anal is directly under that of the dorsal, and the two fins are exactly coterminal. In the

Panama fish the origin is a little behind that of the dorsal, and the anal ends perceptibly in advance of the end of the dorsal. The Peruvian example is gray, instead of dark brown, and it has roundish pale spots, rather than irregular or crescent-shaped pale markings on anterior part of back and side as in Panama specimens.

Other characters, which may or may not prove significant when more specimens become available for study, are: The rather large pectoral fin, which reaches the base of the sixth anal ray in the Peruvian example and generally only to the base of the third ray in the Panama specimens; the Peruvian fish has 16 pectoral rays, which is correct for 4 Panama specimens also, but the other 5 all have 17; the second dorsal has 30 rays in the Peruvian example. Two Panama fish have the same number, but 5 have 31, and 2 have 32 rays.

The name *depressa* alludes to the broad depressed head.

Range.—Known only from the type, taken at Puerto Pizarro, Peru.

Family LOPHIIDAE: Anglers

Head and body anteriorly broad, becoming smaller rapidly from the shoulders backward; head very broad, depressed; mouth excessively large and broad; lower jaw projecting; sharp teeth of unequal size on jaws, vomer, and palatines, mostly depressible; gill opening large, situated in axil of pectoral; skin mostly smooth, naked, with many dermal flaps, especially on head; dorsal fins two, the first with very slender spines, the anterior three or four separate, the rest connected by membrane; second dorsal well removed from the first, rather small, similar to anal; ventrals jugular, far apart, each with one spine and five soft rays; pectoral large, more or less fleshy, with elongate carpal bones forming a distinct "wrist."

A single genus is known from Peru. The first dorsal spine is more or less bristlelike, and generally at least is provided with a membranous flap or bulb at or near tip forming a "bait." The fish supposedly uses this flexible spine, with the bait, to lure small fish to its mouth, which it then may engulf easily. This apparatus and habit have suggested the name angler.

Genus CHIROLOPHIUS Regan, 1903

Teeth in lower jaw in 3 very irregular series; gill opening occupying entire axil of pectoral and extending somewhat above and below it; opercular membrane with free margin, attached along upper margin of "wrist"; first dorsal with 4 to 6 spines; second dorsal with 7 to 9 soft rays; anal with 5 or 6 soft rays; pectoral with 13 to 19 rays.

This genus is characterized largely by the large gill opening. A single species is known from Peru.

CHIROLOPHIUS FORBESII Regan

Chirolophius forbesii Regan, 1913, p. 280, Lobos de Tierra, Peru (original description).

Head (measured to tip of opercular spine) 2.0; depth just behind gill openings 6.2; D. VI–9; A. 6; P. 19.

Body a little broader than deep just behind gill openings; caudal peduncle compressed, slender, 8.1 in head; head longer than broad its greatest width 1.1 in its length, much depressed, its depth 2.5 in its length; snout very broad, 4.0 in head; eye 6.0; interorbital 4.8; mouth superior; lower jaw projecting strongly; maxillary reaching a little beyond anterior margin of eye, 2.1 in head; teeth irregular in size, mostly rather large, pointed, directed obliquely backward; upper jaw with an outer series well separated from two irregular inner series of rather larger teeth, the latter present anteriorly only; teeth in lower jaw similar to inner teeth in upper jaw, but extending back to angle of mouth, and irregularly in three series anteriorly; vomer with a pair of teeth on each side, followed by a single series on palatines; gill openings extending slightly above pectoral when "wrist" is pressed against body, the membrane attached to upper margin of wrist; upper surface of head with rather numerous spines, two divergent spines on outside of nasal sac; two on supraorbital ridge; several in humeral region behind eye; several on side of head principally on margin behind maxillary; opercle with two divergent spines, and a third one at base of the distal pair; dermal flaps numerous on upper surface of head and body, largest on margin of lower jaw; dorsal spines well developed, the first with a large "bait" composed of a long strand of cutaneous tissue attached near tip, length of spine 2.3 in head, the second one a little shorter, the third a little longer, and the fourth of the same length, only the last two connected by membrane at the base, the others rather far apart; second dorsal low, its origin a little behind margin of dermal flap behind gill opening; caudal slightly concave, about as long as snout and eye; anal small, its origin under middle of second dorsal, its base 4.0 in head; ventral moderate, 2.2 in head; pectoral with convex margin, 2.4 (without wrist) in head.

Color gray above, becoming brown at origin of second dorsal; pale underneath; cutaneous flaps much darker than ground color; membranes at base of last two dorsal spines black; second dorsal pale with dark markings; caudal quite dark brown, with an elongate pale spot near midlength of each ray; anal dusky; the rays distally pale; ventral partly dusky; pectoral pale gray at base, then dusky, the tips of the rays pale.

A specimen 137 mm. (117 mm. to base of caudal) long, taken at San Lorenzo Island, near Callao by fishermen, was furnished by the Mission. This is the second specimen of this species to be reported, the type (see reference to Regan above) having been taken at Lobos de Tierra in 8 to 10 fathoms.

Range.—Coast of Peru.

Family ANTENNARIIDAE: Frogfishes

Body somewhat elongate, more or less compressed; head short, deeper than broad; mouth moderately large, nearly or quite vertical; premaxillaries protractile; teeth small, pointed, in a narrow band in each jaw, also usually at least present on vomer and palatines; gill opening quite small, situated at or below "wrist" of pectoral; skin naked, smooth, or prickly; first dorsal consisting of one to three separate spines, the first usually bristlelike, generally if not always provided with a membranous "bait" at tip; second dorsal notably longer than anal; ventrals jugular, rather close together, with one spine and five soft rays; pectoral rather large, with elongate carpal bones, forming a "wrist" set more or less at right angles to rest of fin.

A single genus comes within the scope of the present work. The remarks concerning the angling characteristics of the Lophiidae apply to this family also.

Genus ANTENNARIUS Commerson, 1798

Gill opening very small, situated just below base of wrist of pectoral; skin rough, provided with granules or prickles, and usually with dermal cirri; first dorsal spine with bait, slender, bristlelike, the second and third strong; ventral much shorter than pectoral.

A single species, new to the fauna of Peru, is reported herein.

ANTENNARIUS SANGUINEUS Gill

Cabezón

Antennarius sanguineus Gill, 1863b, p. 91, Cape San Lucas, Baja California (original description).—Meek and Hildebrand, 1928, p. 1013, Panama Bay (synonymy; description; range).

Head measured to margin of opercle 2.6[39]; depth 1.8; D. III–13; A. 8; P. 13.

Body rather short, compressed, its width just posterior to pectoral fin a little greater than half the depth; caudal peduncle long, slender,

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[39] Owing to the peculiar structure of the fish the proportions given are only approximately correct. The margin of the opercle, which is not free, may be felt, if it cannot be seen, underneath the skin.

3.1 in head; head short, deep, rather deeper than long at base of ventral fins; snout very short, 4.8 in head; eye 7.7; interorbital 3.3; mouth vertical; lower jaw slightly included; maxillary rather broad, 1.75 in head; teeth small, in a narrow band on each jaw, vomer and palatines, and a band of similar hyoid teeth; nasal sac virtually undeveloped, the anterior opening with a short tube; gill opening scarcely more than a pore below base of wrist of pectoral; head and body everywhere with prickles, extending also on the fins, nearly all bifid, the prongs divergent, occasionally with a membranous tentacle between them; lateral line pores shielded on each side by pairs of modified enlarged prickles, the line beginning behind eye, curved downward under second dorsal toward base of anal, then near lower edge of caudal peduncle; a row of pores behind premaxillaries to base of first dorsal spine, and then extending backward over eye; another row on margin of preopercle and continued across the mandible; spines of first dorsal well separated from each other and from the second dorsal; the first spine very slender, notably shorter than the second, inserted well behind premaxillary groove, with a fairly large bait composed principally of cutaneous folds, its length 3.4 in head; second and third spines with prickles, the third the longer and attached to back by membrane, 1.75 in head; second dorsal with convex margin, the longest rays only a little shorter than head; caudal round, nearly as long as head; anal small, with convex margin, its origin under third last ray of dorsal, its base 1.9 in head; ventrals rather close together, small 2.3 in head; pectoral broad, with wrist nearly as long as the rest of fin, the two parts nearly at right angles to each other, its length without wrist 1.5 in head.

Color gray, with blotches paler than ground color; two small, well separated ocellated spots on middle of side behind head; minute dark spots around orbit; other indefinite dark spots on head and body; fins all about same color as body, with dark spots arranged to form indefinite cross bars on caudal; second dorsal with large black ocellated spot between bases of the seventh to tenth ray.

One fine specimen, 80 mm. (60 mm. to base of caudal) long, was taken by the Mission at San Lorenzo Island. It agrees well with specimens from Panama Bay with which it was compared.

Range.—Baja California to Peru. Previously apparently not reported from south of Panama Bay.

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